



Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers

Submitted by the Committee to:

U.S. Department of Labor,
Robert B. Reich, Secretary

Mine Safety and Health Administration
J. Davitt McAteer, Assistant Secretary

October 1996

*Secretary of Labor's
Advisory committee on the Elimination of Pnuemoconiosis
Among Coal Mine Workers*

November 14, 1996

The Honorable Robert B. Reich
Secretary of Labor
Washington, DC 20210

Dear Mr. Secretary:

I am pleased to transmit to you the Report of the Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers. This report, which is the final product of the Advisory Committee that you established, contains the comitttee's recommendations on this issue. These recommendations are the result of many days of discussion and debate over the more than six months the Committee deliberated. The recommendations and associated findings reflect the Committee's best judgment on how to eliminate coal workers pneumoconiosis and silicosis which have plagued our Nation's coal miners for far too many years.

I have had the pleasure of serving on a number of expert scientific committees, advisory groups and task forces durning my career. I can state unequivocally that no group with as much diversity of views has made a greater effort at reaching consensus than this Advisory Committee. I believe this effort is well reflected in the carefully considered recommendations as well as the fact that the majority of the recommendations were unanimously approved.

The Committee believes that the recommedations contained in this report are worthy of serious and immediate attention by the Department so that coal miners will be better protected.

Sincerely,

A handwritten signature in black ink, appearing to read "David H. Wegman", followed by a horizontal line.

David H. Wegman, M.D., MS
Chair

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I. SUMMARY

The Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers (Committee) was established by the Honorable Robert B. Reich, Secretary of Labor, on January 31, 1995. The Committee was chartered to ". . . make recommendations for improving the program to control respirable coal mine dust in underground and surface mines in the United States." The Committee was to ". . . examine how to eradicate pneumoconiosis through the control of coal mine respirable dust and the reduction of miners' exposure to achieve the purpose of the Federal Coal Mine Health and Safety Act of 1969 and the 1977 Mine Act amendments" and to ". . . review information and experience in the United States and abroad concerning the prevention of pneumoconiosis among coal miners; the availability of current state-of-the-art engineering controls to prevent overexposure to respirable coal mine dust; and the existing strategies for monitoring of coal mine dust exposures." The Committee was charged to ". . . make recommendations to the Secretary for improved standards, or other appropriate actions, on permissible exposure limits to eliminate black lung disease and silicosis; the means to control respirable coal mine dust levels; improved monitoring of respirable coal mine dust levels and the role of the miner in that monitoring; and the adequacy of the operator's current sampling program to determine the actual levels of dust concentrations to which miners are exposed."

The Committee met five times for a total of 12 days over approximately five months, beginning on February 21, 1996, during which it reviewed technical material and heard formal presentations from a number of scientific experts on respirable dust control and measurement, and from members of the National Black Lung Association. As a scheduled part of each meeting, members of the public representing all segments of the mining community addressed the Committee. The majority of the nearly seventy-five speakers who addressed the Committee were working miners. These miners, many of whom traveled considerable distances to attend Committee meetings, reported that in their opinions, the respirable dust program in this country was in need of drastic revisions to better protect miners. These miners presented testimony on practices that they reportedly observed or participated in that would result in the collection of nonrepresentative dust samples. They called for extensive changes to the respirable dust program to restore its credibility. The Committee also visited three operating coal mines (two underground mines and one surface mine) to observe firsthand the conditions under which the Nation's coal miners work. Finally, the Committee visited the research facility of the Pittsburgh Research Center (PRC), Department of Energy, to learn about current technology in continuous monitoring of respirable coal mine dust and the parameters used in its control.

In an overall approach to this highly complex subject, the Committee identified a number of issues and developed findings and consensus recommendations relative to each issue. In developing consensus recommendations, the Committee operated under a set of ground rules that defined "consensus" as "a majority of the votes cast are in favor of or against the resolution on an issue" and "majority" as "a simple majority of the votes cast except that abstentions are not counted." Members not affirming a resolution to an issue were required to state their rationale for their position.

On the issue pertaining to permissible exposure limits (PELs) for respirable coal mine dust and silica, the Committee recommended the following:

MSHA should develop and enforce separate PELs for exposure to silica and coal mine dust and should explore appropriate methods for determining compliance with exposure limits for mixtures of silica and coal mine dust.

MSHA should consider lowering the level of allowable exposure to coal mine dust. Any reduction in the level should include a phase-in period to allow allocation of sufficient resources to the compliance effort.

The Committee suggests that MSHA cause the lowering of the silica exposure of miners. In this effort, MSHA should seek input from NIOSH and collaborate with OSHA. However, the Committee recommends that MSHA move forward with these efforts and not await possible action by OSHA. MSHA efforts to lower silica exposures below the current PEL might include rulemaking, targeted compliance efforts, encouragement of operator efforts to lower silica exposures below the current PEL, and more extensive silica hazard surveillance. Additionally, MSHA must confirm the accuracy of its analytical procedures to assure that actual exposures are recognized and documented.

The Committee also considered the issue of sampling and continuous monitoring for the purposes of determining noncompliance with the PELs, and for verifying the adequacy of the mine ventilation plan in controlling dust levels. In the area of sampling, the Committee made several recommendations, including:

The Committee considers it a high priority that MSHA take full responsibility for all compliance sampling at a level which assures representative samples of respirable dust exposures under usual conditions of work. In this regard, MSHA should explore all possible means to secure adequate resources to achieve this end without adverse impact on the remainder of the Agency's resources and responsibilities. Compliance sampling should be carried out at a number and frequency at least at the level currently required of operators and MSHA. The miner's representative would be afforded the opportunity to participate in these inspection activities as provided in Section 103(f) of the Mine Act.

The Committee believes that any MSHA resource constraints should be overcome by mine operator support for MSHA compliance sampling. The Committee recommends that to the degree that MSHA's resources cannot alone serve the objective identified, resource constraints should be overcome by mine operator funding for such incremental MSHA compliance sampling. One means for obtaining this support could be a reasonable and fair operator fee, based on hours worked, or other equivalent means designed to cover the costs of compliance sampling. Any operator fee program should include an accountability system to ensure the uniform applicability of the program throughout the industry. The fee should only be utilized for the specific purposes of required compliance sampling.

MSHA should increase the number of samples collected by the Agency to determine

compliance with respirable dust standards. MSHA should place major emphasis on the use of personal monitoring for determining compliance with PELs. However, MSHA should continue the practice of designated occupation sampling for determining noncompliance.

MSHA should change the compliance sampling program to allow use of single full shift samples for determining compliance.

MSHA should complete research (in consultation with other agencies such as NIOSH) to study the relation between indices collected from continuous monitors and the traditional methods of assessing exposure to respirable dust when these different methods are applied to the function of hazard surveillance as well as when developing other potential uses of continuous monitoring data (for example, compliance activity).

Once the technology for continuous dust monitors has been verified, these monitors should be broadly applied in conjunction with other sampling methods for surveillance and determination of dust control at all MMUs and other locations at high risk of elevated dust exposures.

Once verified as reliable (as in (1) above), MSHA should use continuous monitor data for assessing operator compliance efforts in controlling miner exposures, and should consider use of continuous monitor data directly in compliance.

MSHA should develop an initiative to ensure the protection of mine construction workers, contract drillers, and other contractor employees with respirable coal mine dust and silica exposures.

MSHA should take whatever action possible to expedite the development and field testing of a continuous personal monitor to serve a variety of purposes, among them identifying sources and levels of exposure to respirable dust and, as appropriate, for compliance.

The Committee heard testimony from miners who described a number of unfortunate examples where mine dust sampling programs appeared to have been operated improperly. In some mines, dust samples collected by the mine operators were reported to be uncharacteristic. As a result of these instances and related legal cases, it appears that many miners have lost confidence in the dust sampling program. The Committee also heard testimony regarding instances where there was concern with the MSHA sampling program as well. The Committee recognized a need for miner participation in the dust sampling program as well as the ventilation plan approval process and developed the following recommendations:

During this (plan) verification visit, miners and their representatives should have the same paid 103(f) walkaround rights as they do under MSHA inspections.

Miners= participation in the interim operator dust sampling program should be increased to provide assurances that a credible and effective dust sampling program is in place. To that end, miners at each mine should select designated representatives who are employed at that mine for compliance sampling. Miners designated as representatives of the miners should be afforded the opportunity to participate in all aspects of respirable dust sampling for compliance at the mine. That participation would include protection against loss of pay as provided under Section 103(f) of the Federal Mine Act.

Miners= representatives should have the right to participate in dust sampling activities that would be carried out by the employer for verification of dust control plans at no loss of pay. Miners= representatives should also have the right to participate in any activities involving any handling of continuous dust monitoring devices or the extraction of data from continuous dust monitoring devices without loss of pay.

Miners= representatives should receive training and certification to conduct respirable dust sampling paid by the employer. Miners= representatives should be afforded the opportunity without loss of pay from the mine operator to participate in the training of the miners.

A description of work activities and dust exposures on sampling days would be provided to the affected miners by those taking the dust samples.

Miners being sampled should receive in writing by mine operators data on their dust exposure along with any pertinent information on the sampling activities and dust control parameters/production rate, etc. once the sample is analyzed. Written data on the dust exposure of miners being sampled along with any pertinent information on the sampling activities and dust control parameters/production rates should be posted on the mine bulletin board.

The Committee placed strong emphasis on the need for operator-developed ventilation plans that are designed to control the respirable dust to which miners are exposed and the adequacy of which has been verified by both the operator and MSHA under typical mining conditions and is routinely monitored. The Committee made several recommendations on this issue, including the following:

MSHA should develop an administrative review process for timely approval of new or revised plans to permit testing of the adequacy of the plan.

MSHA should define the range of production levels which must be maintained during sampling to verify the plan. This value should be sufficiently close to maximum anticipated production to reasonably assure the operator and the miner that the plan will be effective under typical operations. MSHA should review compliance and production records to determine when there is need for plan modification and verification.

MSHA should require operators to collect respirable dust samples to evaluate the

adequacy of a new or revised plan under typical mining conditions within 30 days of granting provisional approval of the new or revised plan parameters.

Within 30 days of receipt of operator verification data documenting that the plan is effective, MSHA should, in consultation with the operator, perform scheduled independent dust monitoring to verify the operator's plan. Final, minimum operating dust control parameters of the dust control plan should incorporate values measured by MSHA during sampling and, if needed, appropriate data from operator sampling.

MSHA should develop specific performance requirements for operator sampling relative to documentation of continued adequacy of the plan parameters. MSHA should require that the results and monitoring of dust control parameters and production be recorded in order that correlation of dust control parameters with dust measurements is facilitated.

MSHA should specify the circumstances in which dust control plans are needed for surface mines, surface facilities, and surface areas of underground coal mines. MSHA should develop the relevant parameters for surface dust control plans and a process for plan verification.

The Committee determined that surface miners, workers at surface facilities of underground mines, mine construction workers and independent contractors needed to be better protected against the hazards of respirable coal mine dust and silica. In the case of mine construction and independent contracting the Committee concluded that these workers have been neglected under the current coal mine respirable dust program. The Committee made the following recommendations to improve the work environment of workers in these areas:

MSHA should specify the circumstances in which dust control plans are needed for surface mines, surface facilities, and surface areas of underground coal mines. MSHA should develop the relevant parameters for surface dust control plans and a process for plan verification.

Mine operators should continue to measure exposure to respirable dust for DOs, DWPs, and DAs compliance sampling as provided in 30 CFR 70, 71, and 90. Additionally, mine operators should sample as part of plan verification. Operator sampling at surface mines and surface areas of underground mines should be increased to bi-monthly sampling similar to the underground sampling program. Operators should also continue to be allowed to take samples for purposes other than determining compliance. These samples should be clearly identified in the mine such as by using color code.

Abatement of citations based on MSHA or operator samples should require the operators to sample on multiple shifts as currently required.

MSHA should develop an initiative to ensure the protection of mine construction workers, contract drillers, and other contractor employees with respirable coal mine dust

and silica exposures. This effort should include estimation of the types of contractors, number of workers at risk and their levels of exposure; exploration of means of assuring compliance with permissible exposure limits, the use of dust control plans, sampling and training; delineating responsibility of mine operators and contractors in protecting contractor workers; and implementation of compliance activities to protect this sector of mine workers. MSHA should also improve recordkeeping of exposure to dusts, occupational lung disease, and other hazards that occur to workers of construction and other contractors in order to prevent occupational disease and injury.

MSHA should work with NIOSH to expand medical surveillance to appropriate groups of mine contractor workers and to conduct research pertinent to preventing respiratory disease and respirable dust exposures in mine contractor workers.

MSHA should collaborate with OSHA in bringing similar attention to operations such as exploratory drilling, which fall under OSHA jurisdiction.

Sampling irregularities have been documented involving the collection of samples. Since 1990, more than 150 mine operators, agents and contractors have pled or been found guilty of submitting fraudulent samples to MSHA. To address concerns in this area, the committee made the following recommendations:

MSHA in conjunction with the Department of Labor Solicitors Office should review the current process for investigating and acting on respirable dust practices which result in unrepresentative respirable dust samples and should create a credible, adequately staffed program for such investigations.

MSHA should exercise more oversight on operators= sampling methods and management of samples including periodic audits of dust sampling programs.

The Committee recognizes the problem of miner representation and participation in the dust control programs at mines not represented by a recognized labor organization and recommends that MSHA target such mines for compliance sampling. MSHA targeting should be active in nature and should consider many factors including miner input, compliance history, and medical surveillance data. Given the seriousness of this problem, MSHA should immediately start auditing and appropriately targeting these types of operations.

On the issue of medical surveillance, and improvements in this area, the Committee recommended the following:

Medical testing of underground coal miners should be extended to surface miners.

MSHA should work with NIOSH to expand medical surveillance to appropriate groups of mine contractor workers and to conduct research pertinent to preventing respiratory disease and respirable dust exposures in mine contractor workers.

In addition to the chest radiographs at the time of employment and then at the specified intervals thereafter, spirometry and questionnaire data should be collected periodically during a miner=s employment. Testing with these modalities will allow the identification of those miners with possible early dust-related health effects.

NIOSH should share the findings of the medical surveillance data with MSHA.

A plan should be developed by NIOSH in consultation with MSHA to determine which cases should be followed-up considering, for example, the severity of findings, clustering of abnormalities and the potential for primary prevention. This plan should assure that the confidentiality of the miner is protected.

MSHA should examine the effectiveness of controls operating at work sites represented by these miners.

Miners identified with abnormal screening tests may benefit from appropriate secondary prevention efforts and appropriate miner education regarding the nature of mining-related lung diseases.

NIOSH should oversee the provision of confidential periodic medical examination programs for all mine workers including surface miners in order to achieve at least 85% participation rate.

NIOSH should specify performance standards for medical testing; collect data on medical testing, perform ongoing analysis of surveillance data as well as to locate "hot spots", perform field investigations when warranted by hot spots or other surveillance findings in conjunction with MSHA.

MSHA should mandate operator medical examination programs, and supply appropriate MSHA-collected exposure and employment data to NIOSH for surveillance purposes. In cooperation with NIOSH, MSHA should consider what additional exposure or employment data should be obtained from the operator to further the objectives of medical surveillance, and perform field investigations when warranted by hot spots or other surveillance findings.

Mine operators should pay for the mandated medical testing.

Miner participation should be improved by arranging convenient access to examinations, effective education about the purposes of the testing, timely notification of results of the testing, and maintenance of confidentiality. Additional benefit will be gained by promoting the development of effective and accurate exposure classification.

NIOSH should develop a program to track ex-miners and provide them with the same tests available to active miners.

The Committee also made a number of recommendations in the areas of education and training, hazard surveillance, and research. On the issue of education and training, the Committee recommendations included the following:

MSHA should consider changes to assure that the training program is appropriately structured and staffed to carry out education and training functions related to dust control issues. MSHA should conduct these activities in a manner that provides quality assistance to the mining industry and oversight of training programs. When cases of overexposure occur to respirable dusts, education and training personnel should be assigned to investigate possible failures in the education and training of miners and mining personnel at mines where these overexposures occur. In addition, MSHA should place high priority on filling the director of training position as soon as possible.

It is likely that adequate training cannot be delivered in the current time frames allowed to train, therefore, MSHA should review and consider restructuring as well as expanding its existing training programs to better meet the objective of a workforce with a comprehensive understanding of the potential long-term hazards of dust exposure, able to recognize dust sources and be effective partners with the operators in the routine maintenance of the dust control parameters.

MSHA should evaluate the content, duration, adequacy and methods of training for each content area. The evaluation must specifically include the adequacy of treatment of the following topics which should be included in initial training in addition to annual training.

- X health hazards of respirable coal mine dust overall
- X health hazards of respirable silica dust
- X objectives and content of a model dust control plan
- X the specifics of the dust control plan at the specific mine
- X MSHA process for approval of dust control plan
- X sources of dust generation
- X control of dust sources
- X dust control parameter ranges approved for the mine operations
- X relative effectiveness of various dust control measures included in the plan
- X mechanisms for reporting deficiencies and implementing corrective actions
- X function and importance of monitoring exposure
- X function and importance of medical surveillance, including local resources (e.g., company, NIOSH)
- X how to review reports of exposure monitoring
- X sources of additional information and assistance

The review should also include the methods of delivery; where not currently applied,

proven, effective interactive methods of adult learning should be incorporated into program revisions.

MSHA should explore ways in which inspectors, during their normal work detail, might function to improve understanding of the role of enforcement activities in control of dust and disease.

MSHA should review, revise, and update the program to train and certify persons for taking dust samples. MSHA should require annual update training for certification and maintenance for the purpose of keeping these persons up to date with sampling methods and regulations, and for maintaining their expertise. If certified persons do not perform their duties properly, MSHA should consider retraining and/or de-certification.

On the issue of hazard surveillance the Committee recommended that:

Hazard surveillance guidelines should be developed with the assistance of NIOSH for use by operators in maintaining and improving dust controls. These guidelines should directly and effectively utilize sampling results and measures related to control of respirable dust. These guidelines should specifically identify any trends or exposure levels that indicate deteriorating or marginally adequate conditions. A report of these findings should be included in MSHA's report of respirable dust samples results provided to the operator and to the miners= representative, and alert them that there is a need for a systematic reexamination of the continued effectiveness of existing control measures.

Hazard surveillance guidelines should also be developed for ventilation plan parameters that are regularly reviewed. These should be designed to assist operators in early identification of adverse trends in the parameters that, if not corrected, may cause miners to be exposed to higher dust levels.

In addition to specific recommendations for medical and epidemiologic research, research on the mechanisms of coal mine dust generation and control, applied engineering control research, and

research into dust sampling methods and surveillance, the Committee made the following general recommendation on the issue of needed research:

The NIOSH Criteria Document lists research needs pertinent to coal miner respiratory health and prevention of disease in the following areas: engineering control methods, respiratory protection, sampling devices, sampling strategy, medical screening and intervention, adverse health effects of dust exposure, characterization of dust, and training and education. The primary focus of NIOSH with regard to the prevention of CWP needs to be ongoing analysis of the medical surveillance program data for hot spots, in order to direct primary prevention efforts where they are most likely to be of direct and immediate benefit to miners. To the degree that research activities do not take precedence over or detract from resources devoted to meaningful administration of the medical surveillance program, the Committee concurs with these research needs. The Committee recommends increased funds for research into fundamental and applied aspects of respirable dust control as well as health effects research.

II. INTRODUCTION

The Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers (Committee) was established by the Honorable Robert B. Reich, Secretary of Labor on January 31, 1995 in accordance with the provisions of the Federal Advisory Committee Act (FACA) and Sections 101(a) and 102(c) of the Federal Mine Safety and Health Act of 1977 (Mine Act), (See the Advisory Committee Charter, included as Appendix A of this Report; and the Federal Register Notice of Establishment of Advisory Committee [60 FR 5947, January 31, 1995], included as Appendix B of this Report).

The Committee was chartered to ". . . make recommendations for improving the program to control respirable coal mine dust in underground and surface mines in the United States." The Committee was to ". . . examine how to eradicate pneumoconiosis through the control of coal mine respirable dust and the reduction of miners' exposure to achieve the purpose of the Federal Coal Mine Health and Safety Act of 1969 and the 1977 Mine Act amendments" and to ". . . review information and experience in the United States and abroad concerning the prevention of pneumoconiosis among coal miners; the availability of current state-of-the-art engineering controls to prevent overexposure to respirable coal mine dust; and the existing strategies for monitoring of coal mine dust exposures." The Committee was charged to ". . . make recommendations to the Secretary for improved standards, or other appropriate actions, on permissible exposure limits to eliminate black lung disease and silicosis; the means to control respirable coal mine dust levels; improved monitoring of respirable coal mine dust levels and the role of the miner in that monitoring; and the adequacy of the operator's current sampling program to determine the actual levels of dust concentrations to which miners are exposed."

Nominations for Committee membership were solicited by the Mine Safety and Health Administration (MSHA). As required by Section 102(c) of the Mine Act, a majority of the Committee members were individuals who had no economic interest in the mining industry and who were not operators, miners, or officers or employees of the Federal Government or any state or local government ("neutrals"). The nine-member Committee was comprised of two labor representatives, two industry representatives, and five neutrals.

The members selected to serve on the Committee provided a diverse range of collective professional experience in the field of occupational health. The following is a list of the Committee members. A summary of the background of each member of the Committee indicating their respective affiliations at the time they served is provided in Appendix C.

NEUTRALS

David Wegman, M.D., Chairperson
Professor and Chair
Department of Work Environment
College of Engineering
University of Massachusetts Lowell
Lowell, Massachusetts
Kathleen Kreiss, M.D.¹

John Dement, Ph.D., C.I.H.
Assistant Professor
Division of Occupational and
Environmental Medicine
Duke University Medical Center
Durham, North Carolina
Professor and Residency Director

Dept. of Preventive Medicine and
Biometrics
University of Colorado Health Sciences Ctr.
Denver, Colorado

Raja V. Ramani, Ph.D., P.E.
Professor and Head
Department of Mineral Engineering
The Pennsylvania State University
University Park, Pennsylvania

Carol Rice, Ph.D., C.I.H.
Associate Professor of Environmental
Health
Kettering Laboratory
University of Cincinnati
Cincinnati, Ohio

LABOR

Joseph Main
Administrator
Department of Occupational Health and
Safety
United Mine Workers of America
Washington, D.C.

James Weeks, Sc.D., C.I.H.
Associate Research Professor
Division of Occupational and
Environmental Medicine
George Washington University
Washington, D.C.

INDUSTRY

John Gibbs, M.D.
Vice President of Health Management and
Corporate Medical Director
Kerr McGee Corporation
Oklahoma City, Oklahoma

Joseph Lamonica
Vice President for Health, Safety, and
Training
Bituminous Coal Operators= Association
Washington, D.C.

¹ On August 5, 1996 Dr. Kathleen Kreiss advised the Chair of the Committee that she was expecting to receive an offer of employment from NIOSH and that if the offer was acceptable, she intended to accept it. She withdrew from active participation on the Committee at that time. Dr. Kreiss subsequently wrote to Dr. Wegman on August 16, 1996, advising him that she had received and accepted an offer of employment from NIOSH. Both communications have been submitted to the record of the Committee.

Staff assistance was provided to the Committee by MSHA, the National Institute for Occupational Safety and Health (NIOSH) and the Pittsburgh Research Center (PRC), Department of Energy. A list of technical staff members indicating their respective affiliations at the time they served follows:

MSHA

Edward J. Miller, P.E., Designated Federal Official
Senior Engineer
Directorate of Technical Support
Arlington, Virginia

Edward Sexauer, Esq.
Office of the Solicitor
U. S. Department of Labor
Arlington, Virginia

Robert A. Haney, M.S., P.E.
Supervisory Mining Engineer
Dust Division
Bruceton Safety and Health Technology Center
Bruceton, Pennsylvania

Pamela King
Program Analyst
Office of Standards, Regulations, and Variances
Arlington, Virginia

Jon Kogut, M.S.
Mathematical Statistician
Office of Program Policy Evaluation
Golden, Colorado

Maude Morgan
Secretary
Division of Health
Coal Mine Safety and Health
Arlington, Virginia

George E. Niewiadomski
Mine Safety and Health Specialist
Division of Health
Coal Mine Safety and Health
Arlington, Virginia

Bryan P. Sargeant
Supervisory Mine Safety and Health
Specialist
Benton Subdistrict Office
CMS&H District 8
Benton, Illinois

Linda Zeiler, M.S.
Industrial Hygienist
Directorate of Technical Support
Arlington, Virginia

NIOSH

Gregory Wagner, M.D.
Director
Division of Respiratory Disease Studies
Morgantown, West Virginia

PRC

Robert Jankowski
Group Supervisor
Dust Control and Ventilation Group
Pittsburgh Research Center
Bruceton, Pennsylvania

The Committee requested and was provided with extensive material in the areas under consideration by the Committee. This material included:

- X Report of the Coal Mine Respirable Dust Task Group "Review of the Program Control Respirable Coal Mine Dust in the United States" including reports by expert teams;
- X NIOSH Criteria Document "A Recommended Standard - Occupational Exposure to Respirable Coal Mine Dust";
- X Peer Review Comments on the Draft NIOSH Criteria Document by MSHA, Bureau of Mines (BOM), and Dr. John Gibbs;
- X 30 CFR Part 70, Mandatory Health Standards-Underground Coal Mines;
- X 30 CFR Part 71, Mandatory Health Standards-Surface Coal Mines and Surface Work Areas of Underground Coal Mines;
- X 30 CFR Part 90, Mandatory Health Standards-Coal Miners Who Have Evidence of the Development of Pneumoconiosis;
- X Final Rule - 30 CFR Part 56, et. al. Air Quality: Health Standards for Abrasive Blasting and Drill Dust Control, [59 FR 8318, 2/18/94];
- X Final Rule - Safety Standards for Underground Coal Mine Ventilation [61 FR 9764, 3/11/96];
- X Final rule - Respirable Dust; and Ventilation System and Methane and Dust Control Plan, Parts 11, 70, 71, 75 and 90, Respirable Dust, [45 FR 23990, 4/8/80];
- X Final Rule - Ventilation System and Methane and Dust Control Plan. 30 CFR Part 75 [45 FR 24004, 4/08/80];
- X Proposed Rule - Miner Participation in Respirable Dust Sampling Procedures. 30 CFR Part 70 [45 FR 24008, 4/8/80];
- X Proposed Rule - 30 CFR Part 71. Respirable Dust. [45 FR 24009, 4/8/80];
- X A Decade of Respirable Dust Research for the Mineral Industries, Volume 14, The Pennsylvania State University, 1995;
- X "Development of Effective Protection Factors for Racal Airstream Helmets," The University of Utah, August 1994, Energy West Mining Company, Huntington, UT; and
- X Numerous published technical papers on the subject of respirable dust and coal workers= pneumoconiosis (CWP). See Appendix D for a complete list of materials provided to the Committee.

The Committee met for a total of 12 days over approximately five months. The Committee meetings were chaired by Dr. David Wegman, and notice of the time, place and agenda for each meeting was duly published in the Federal Register (FR). Meetings were open to the public, and time was made available during each meeting for the public to address the Committee. As a result, during the 11 hours of public comment, the Committee heard from approximately seventy-five speakers, the majority of whom were working miners. These miners, many of whom traveled considerable distances to attend Committee meetings, reported that in their opinions, the respirable dust program in this country was in need of drastic revision. These miners presented considerable testimony on practices that they reportedly observed or participated in that would result in the collection of unrepresentative dust samples. A verbatim transcript of each meeting, including the testimony of those who appeared before the Committee, was taken and detailed minutes were kept. A summary of the testimony of those who appeared before the Committee is contained in Appendix E.

To address the range of issues and review the associated background material more effectively, the Committee established workgroups to address two specific issues: Medical Surveillance and Mine Ventilation Plans (See Appendix F). For brevity, this report is limited to summary documentation, discussions, and findings supporting the recommendations and is not meant to be a treatise of the deliberations of the Committee.

During its three mine visits, the Committee obtained a firsthand view of respirable dust control technology being used at the Dilworth Mine near Washington, Pennsylvania; the Hobet No. 21 Surface Mine near Charleston, West Virginia; and the Deercreek Mine near Price, Utah. These visits, which provided the Committee with invaluable insight, were made possible through the efforts of Mr. Joseph Lamonica, Committee member, and the individual mine operators. Active participation by the representatives of miners at each mine was facilitated in large degree through the efforts of Mr. Joseph Main, Committee member.

In addition, scientific experts in pertinent areas presented information and responded to questions by Committee members. The Committee extends its sincere appreciation and thanks to mine management, the representatives of miners and individual miners at the Dilworth Mine, the Hobet No. 21 Surface Mine, and the Deercreek Mine, for their cooperation and assistance provided during the Committee's visits; to representatives of the National Black Lung Association who gave compelling testimony on the effects of respirable coal mine dust exposure; and to the members of the public, including those from both labor and industry, who presented information or attended the Committee meetings and demonstrated a genuine interest in the health and safety of the Nation's coal miners. Staff experts from MSHA, NIOSH, and PRC were present at each meeting and during each mine visit to assist the Committee, as necessary.

III. BACKGROUND

In 1969, the Surgeon General of the United States estimated that over 100,000 active and retired miners were afflicted with coal workers' pneumoconiosis (CWP), commonly known as Black

lung@.¹ Partially to combat this occurrence of CWP, the Federal Coal Mine Health and Safety Act of 1969 (Coal Act)², was enacted into law. This landmark mining legislation established key occupational health provisions that were intended to: 1) prevent disabling respiratory diseases such as CWP; 2) provide for early detection of the disease; and 3) protect those miners with evidence of the disease.³ The Coal Act provided benefits for miners who develop CWP.

The Coal Act was amended by the Federal Mine Safety and Health Act of 1977 (Mine Act)⁴, which moved enforcement responsibilities to the newly created MSHA in the Department of Labor, strengthened the enforcement provisions of the Coal Act, brought metal and non-metal mines under the same agency, and provided for more miner education. The other principle features of the Coal Act were maintained.

¹ Statement by Senator Harrison Williams, Chairman of the Senate Committee on Labor and Public Welfare, Legislative History of the Federal Coal Mine Health and Safety Act of 1969 (Public Law 91-173) August 1975, Part 1, page 240, U.S. Government Printing Office, Washington, D.C. 1975.

² Federal Coal Mine Health and Safety Act of 1969, 30 U.S.C. 801 et. seq.

³ Coal Act.

⁴ Federal Mine Safety and Health Act of 1977, Public Law No. 95-164, 91 Stat. 1290 (1977), Codified at 30 U.S.C. ' ' 801 et. seq.

Today, the respirable coal mine dust levels are significantly lower than they were prior to passage of the Coal Act. For example, federal mine inspector sampling results during 1968-69 showed that the average dust concentration in the environment of the continuous miner operator was 7.7 mg/m³.⁵ During Fiscal Year 1995, the average dust level determined from MSHA samples for that occupation had been reduced to 1.2 mg/m³.⁶ Nonetheless, cases of CWP and silicosis are still being identified. According to a 1994 NIOSH report, the total number of death certificates in the United States with mention of CWP between 1968 and 1990 was 55,476.⁷ Although not only associated with coal mining, during the same period the total number of death certificates with mention of silicosis, a related occupational disease contracted by coal miners, was 13,744.⁸ The current cost of black lung benefits to the federal government exceeds \$1.2 billion annually, and the total costs of the program since its inception are approaching \$33 billion.⁹

Consistent with the mandates of both the Coal Act and the Mine Act that all miners be able to work their entire working lives in the mines without incurring any disability from black lung or other occupationally caused disease, the Secretary of Labor has chartered the Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers to examine ways to eradicate CWP and silicosis and to make recommendations on ways to improve the program to control respirable coal mine dust.

A. Respirable dust standards.

The Coal Act established the first comprehensive national respirable coal mine dust standard for U.S. coal mines. The respirable coal mine dust standard established by the Coal Act is the most stringent among the world's coal producing nations. The respirable coal mine dust standard was based upon studies conducted in Great Britain, and was intended to provide almost complete protection from CWP by imposing a strict limit on the amount of respirable coal mine dust allowed in the mine atmosphere to which miners are exposed. The Committee recognizes that

⁵ Wheeler, H. P., "The Working Environment: Statement of the Steps and Rationale for Action Taken by the Department of the Interior," Papers and Proceedings of the National Conference on Medicine and the Federal Coal Mine Safety and Health Act of 1969, June 15-18, 1970, 28-34.

⁶ Summary of Operator/Inspector Sampling, Report MSN 111, Run Date: 11/20/95.

⁷ U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, "Work-Related Lung Disease Surveillance Report 1994," p. 28.

⁸ "Work-Related Lung Disease Surveillance Report 1994," p. 47.

⁹ Personal communications with the Social Security Administration (8/3/96) and Department of Labor (7/29/96).

this standard, as well as the other health and safety standards established by the Coal Act and retained in the Mine Act, was an interim standard and that the Mine Act directs that improved mandatory health or safety standards to protect the health and safety of the Nation's coal or other miners be developed and promulgated.

Under the Coal Act, mine operators were required to implement programs to control the amount of dust in the mine atmosphere prior to coal extraction, to obtain federal government approval of those programs, and to take accurate dust samples at periodic intervals using approved sampling devices. The Coal Act also required that citations be issued whenever respirable coal mine dust samples collected by either an operator or federal mine inspector showed noncompliance with the dust standard.

The respirable coal mine dust provisions of the Coal Act remained essentially unchanged by enactment of the Mine Act in 1977. Specifically, the Mine Act, and its predecessor legislation, require that as of December 30, 1972:

" . . . each operator shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings of such mine is exposed at or below 2.0 milligrams of respirable dust per cubic meter of air."¹⁰

Under current MSHA regulations, this standard is further reduced when the respirable coal mine dust contains more than five percent quartz.¹¹ In addition, miners who have early evidence of the development of CWP, and who have elected to work in a low-dust environment, cannot be exposed to respirable coal mine dust above 1.0 milligrams per cubic meter (mg/m³). This standard can be further reduced if the work environment contains more than ten percent quartz dust.¹²

B. Sampling for Respirable Dust.

In 1970, federal regulations were issued that initiated a comprehensive mine operator dust sampling program based on the "high risk occupation" concept. Under this concept, the environment of the occupation on the working section exposed to the highest respirable dust concentration is sampled. All other occupations on the section are assumed to be in compliance when the high risk occupation is in compliance. The "high risk occupation" for each method of mining was identified in the regulation.^{13,14} Additionally, each miner was sampled individually

¹⁰ Mine Act.

¹¹ 30 CFR, Section 70.101 and Section 71.101.

¹² 30 CFR, Section 90.101.

¹³ 35 FR 5544, April 3, 1970.

at different intervals. These individual sample results were not used for enforcement purposes but were provided to NIOSH for medical research purposes. Government investigations during the 1970s disclosed that the dust sampling data could not be considered reliable.¹⁵ Miners also testified at public hearings describing how the current system was allowing unrepresentative sampling to occur.

¹⁴ *Report to the Congress*, Comptroller General of the United States, General Accounting Office, December 31, 1975, p. 7.

¹⁵ *Report to the Congress*, p. 15.

The regulations governing the mine operator sampling program were revised in 1980. According to MSHA, as a result of this revision the number of samples required to be taken annually decreased significantly from approximately 500,000 samples to fewer than 70,000 today. These regulations are currently in effect and continue to require sampling of the environment of the "high risk occupation" every two months. The "high risk occupation" is now referred to as the "designated occupation" (DO).¹⁶

MSHA also conducts sampling, and the Agency collected over 20,000 samples in FY 1995. These samples were taken by inspectors on multiple occupations for the following purposes: (1) to determine if a noncompliance condition existed at the time of sampling; (2) to assess the effectiveness of the operator's dust control program; (3) to determine the presence of excessive levels of quartz dust which may necessitate a reduction of the dust standard; and (4) to identify occupations other than the DO that might be at risk.

C. Unrepresentative Samples.

Throughout the history of the dust monitoring program, most mine operators have conscientiously attempted to sample miners' exposure to respirable coal mine dust as required under the regulations. Nevertheless, soon after the program was implemented in 1970, miners began complaining of irregularities in sampling practices. These allegations continued and such practices were described by many of the miners who testified before the Committee in 1996.

Sampling irregularities have been documented involving the collection of samples. Since 1990, more than 150 mine operators, agents and contractors have pled or been found guilty of submitting fraudulent dust samples to MSHA. Additionally in 1991, citations were issued to more than 500 mining companies for submitting dust samples with what appeared to be uncharacteristic dust depositions (i. e. Abnormal white centers) on the sample filter. The Secretary of Labor alleged that these AWC cases, as they became known, resulted from tampering with samples. However, these citations were not upheld by the Federal Mine Safety and Health Review Commission. These cases have been appealed by MSHA. Given this history, the Committee believes that reforms to the dust monitoring program are needed to improve the reliability of the samples and restore the credibility to the sampling program.

D. The MSHA Coal Mine Respirable Dust Task Group Report.

¹⁶ 45 FR 23990, April 8, 1980.

In response to concerns about the coal mine dust sampling program, in 1991 MSHA undertook an extensive review of the Agency's respirable dust control program. The MSHA Coal Mine Respirable Dust Task Group Report, issued in June 1992, found that problems existed in the current sampling and enforcement programs which could impact miner health protection. Recommendations were made for improving both MSHA's enforcement and the operator's sampling programs.¹⁷ The majority of the Task Group recommendations would have required regulatory change. Initially, MSHA planned to proceed to notice and comment rulemaking to implement these recommendations. MSHA subsequently decided that since a Federal advisory committee was to be established, that committee would provide the best forum in which to identify the critical needs for revised rules and procedures, and consider both the scientific issues and the concerns of the miners and mine operators. In January 1995, the Secretary of Labor announced his intention to convene a Federal advisory committee to address these and other issues.

E. Recent Regulatory Changes

In 1996, MSHA promulgated regulations revising the safety standards for underground coal mine ventilation.¹⁸ As part of this rulemaking effort, changes were made to two sections of the regulations dealing directly with areas under consideration by the Committee. Under ' 75.362(a)(2), a person designated by the operator must conduct an examination to assure compliance with the respirable dust control parameters specified in the mine ventilation plan. This examination is to be completed prior to production unless a shift change is accomplished without an interruption in production, in which case it must be completed within one hour following the shift change. This examination is to include air quantities and velocities, water pressures and flow rates, excessive leakage in the water delivery system , water spray numbers and orientations, section ventilation and control device placement, and any other dust suppression measures required by the ventilation plan. The regulation also provides that when continuous monitoring is used, additional measurements of the air velocity and quantity, and water pressure and flow rates are not required.

Section 75.370 contains the requirements for the submission and approval of the mine ventilation plan. As revised, ' 75.370 provides for an increased role for the representative of miners in the plan approval process. Specifically, the mine operator must notify the representative of miners at least 5 days prior to the submission of a mine ventilation plan or any revision to a mine ventilation plan. If requested, the mine operator must provide a copy of the plan to the representative of miners at the time of notification. Following receipt of the proposed plan, the regulation provides that the representative of miners may submit timely comments to the MSHA

¹⁷ U. S. Department of Labor, Mine Safety and Health Administration, "Review of the Program to Control Respirable Coal Mine Dust in the United States, Report of the Coal Mine Respirable Dust Task Group," June 1992.

¹⁸ 61 FR 9764 (March 11, 1996).

district manager, in writing, for consideration during the review process.

F. Single-Shift Sampling.

On February 18, 1994, MSHA published a notice in the Federal Register¹⁹ announcing its intention to use single, full-shift respirable dust measurements in addition to the average of multiple, full-shift respirable dust sample results to determine noncompliance and issue citations for violations of the respirable dust standard under the MSHA coal mine respirable dust program. Concurrently with this publication by MSHA, the Department of Labor and the Department of Health and Human Services published a joint notice in the Federal Register²⁰ announcing a proposed finding that a single full-shift measurement, after applying valid statistical techniques to account for the precision of the analytical and sampling methods, will accurately represent the atmospheric conditions with regard to the respirable dust concentration during the shift in which it was taken.

G. NIOSH Criteria Document.

In November of 1995, NIOSH issued a criteria document dealing with occupational exposure to respirable coal mine dust.²¹ In this criteria document, NIOSH concluded that coal miners in the United States continue to be at risk of developing CWP. The criteria document recommendations included reducing the allowable exposure to respirable coal mine dust, citing recent studies that provided evidence that the risk of developing CWP at the current standard of 2.0 mg/m³ is greater than had been predicted. NIOSH recommended that exposures to respirable coal mine dust be limited to 1 mg/m³. Also, NIOSH recommended a 50 percent reduction in the permissible exposure limit (PEL)²² for respirable crystalline silica (quartz) dust, from 100 micrograms per cubic meter (µg/m³) to 50 µg/m³, to address continued risk of developing

¹⁹ 59 FR 8356 (February 18, 1994).

²⁰ 59 FR 8357 (February 18, 1994).

²¹ NIOSH, "Criteria for a Recommended Standard, Occupational Exposure to Respirable Coal Mine Dust," Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, DHSS (NIOSH) Publication No. 95-106, (1995).

²² Throughout the report the term "permissible exposure limit" (PEL) is used in reference to the standards for respirable coal mine dust or for respirable silica as set out in MSHA regulations. The Committee recognizes that, at the present time, the term PEL is not used in the MSHA regulations with respect to respirable coal mine dust or respirable silica.

silicosis or mixed-dust pneumoconiosis.

IV. TASK OF THE ADVISORY COMMITTEE

Charter:

To help achieve the purpose of the Coal Act of 1969 and the 1977 Mine Act the duties of the Committee included an examination of how to eradicate CWP through the control of coal mine respirable dust and the reduction of miners' exposure. Specifically, the Committee was chartered to "... review information and experience in the United States and abroad concerning the prevention of pneumoconiosis among coal miners; the availability of current state-of-the-art engineering controls to prevent overexposure to respirable coal mine dust; and the existing strategies for monitoring of coal mine dust exposures." The charter charged the Committee with providing consensus recommendations to the Secretary for:

- X improved standards, or other appropriate actions, on permissible exposure limits to eliminate black lung disease and silicosis;
- X the means to control respirable coal mine dust levels;
- X improved monitoring of respirable coal mine dust levels;
- X the role of the miner in that monitoring; and
- X the adequacy of the operator's current sampling program to determine the actual levels of dust concentrations to which miners are exposed.

Other considerations:

Many of the issues under consideration by the Committee were the same as those addressed by NIOSH in its recently published Criteria Document. During the second meeting of the Committee held in Pittsburgh, Pennsylvania, the Agency spokesperson addressed the issues dealt with in the Criteria Document as follows:

"... MSHA has determined that it will respond to the Criteria Document by publishing a proposed rule to protect miners from exposure to respirable coal mine dust. Although MSHA will begin preliminary work on a proposed rule, the Agency will defer full development and publication of the proposed rule until it can fully consider the broad range of recommendations expected to be issued in the fall by the Secretary's Advisory Committee to Eliminate Pneumoconiosis Among Coal Mine Workers. ... the Advisory Committee is free to consider and use any information contained in the Criteria Document as the Committee develops its own recommendations."²³

²³ This Agency position is published in the Federal Register, 61 FR 18308 (April 25, 1996).

The Committee also heard testimony on the activities of MSHA=s Coal Mine Respirable Dust Task Group and addressed many of the issues considered in the Task Group Report.

The matter of MSHA=s intention to use single, full-shift respirable dust measurements in addition to the average of multiple, full-shift samples to determine noncompliance and issue citations for violations of the respirable dust standards was not specifically referred to the Committee for consideration. The following Agency position was read into the record during the Committee=s first meeting in Arlington, Virginia:

The Agency has begun a proceeding on the issue of single-shift sampling. The Secretaries of Labor and Health and Human Services have issued a joint proposed finding that the average concentration of respirable dust to which each coal miner is exposed can be measured accurately over an 8-hour shift. The Agency published a proposed notice of its intention to enforce the dust regulations based on single-shift sampling.

This single-shift sampling notice was published in the Federal Register two years ago as a joint notice with NIOSH.²⁴ We have held hearings and are about to reopen the record on a technical issue.

The Committee is at liberty, of course, to discuss the entire MSHA sampling program; however, MSHA is not formally seeking recommendations from the Committee on its pending proposal concerning single-shift sampling; nor is the single-shift sampling proposal specifically mentioned in the Committee's charter.

The Agency=s position notwithstanding, the Committee did consider the issue of single-shift sampling for compliance and made a specific recommendation addressing this matter. Also addressed was the issue of the number of samples required for abatement of citations issued and based on single-shift samples.

²⁴ 59 FR 8357.

V. REPORT OF COMMITTEE ACTIVITIES

Committee meetings were held in Arlington, Virginia; Pittsburgh, Pennsylvania; Charleston, West Virginia; Salt Lake City, Utah; and Lexington, Kentucky. The Committee also made fact-finding visits to the Dilworth Mine, near Washington, Pennsylvania; the Hobet No. 21 Surface Mine, near Charleston, West Virginia; the Deercreek Mine, near Price, Utah; and the Pittsburgh Research Center in Bruceton, Pennsylvania.

First Meeting

The first meeting of the Committee was held on February 21 and 22, 1996, in Arlington, Virginia. The two-day meeting was attended by 14 members of the public, two of whom elected to address the Committee on the issues under consideration.

Mr. J. Davitt McAteer, Assistant Secretary of Labor for Mine Safety and Health, officially welcomed the members of the Committee on behalf of the Secretary of Labor. Mr. McAteer briefly described the Committee's purpose, and stressed the importance of its role in thoroughly examining and evaluating the full range of respirable dust issues and making recommendations that will lead to the elimination of black lung and create a more healthful workplace for the Nation's coal miners.

The Committee Chair, Dr. David Wegman, welcomed the Committee members and requested that members briefly introduce themselves. He then addressed the charge, welcoming the challenge assigned to the Committee to find ways to eradicate CWP among coal miners. He stated the need to set a goal to eliminate all disabling coal worker-related lung disease and then outlined the tasks of the Committee and suggested ways that the Committee could proceed with its charge. Dr. Wegman outlined specific elements of the charge and identified key issues that needed to be addressed. Also discussed were the ground rules under which the Committee would operate.

Dr. Gregory Wagner, Director of Respiratory Disease Studies, NIOSH, and a member of the Committee staff, spoke on the recent evidence of the persistence of CWP and silicosis in coal miners. Dr. Wagner told the Committee that, while the data show substantial improvement in the number of miners with disease, CWP has yet to be eradicated. He indicated that the original goal was to prevent progressive massive fibrosis (PMF). Based on earlier studies, it appeared that if the disease progression was limited to category 1 or less CWP, miners were unlikely to develop PMF, and a remarkable improvement would be achieved in coal miners' health. Unfortunately, according to Dr. Wagner, the evidence today does not support this earlier conclusion.

Mr. Ronald Schell, Chief of the Division of Health for MSHA's Coal Mine Safety and Health, presented an overview of MSHA's Program to Control Exposure to Respirable Coal Mine Dust with specific focus on three elements: operator ventilation plans for controlling dust, monitoring by operators, and monitoring by MSHA. He discussed the type of sampling strategies being

used, the purposes for sampling, and the frequency at which sampling is being carried out. Also discussed were specifics of the MSHA quartz program and pending regulatory activity. In response to Committee questions regarding the issuing of citations based on a single sample, Mr. Miller responded by reading into the record a statement outlining the Agency=s position on this matter. Mr. Miller also clarified MSHA=s responsibility in responding to the NIOSH Criteria Document and indicated that the Agency would make a decision shortly regarding the specific action it intends to take.

Mr. John Murphy, Research Director of the Pittsburgh Research Center, reviewed the PRC significant accomplishments relative to respirable dust, the current trends in mining technology, the PRC current research program, and provided his perspective on the outstanding respirable dust issues and research needs to address these issues.

Mr. Robert G. Peluso, Chief of MSHA=s Pittsburgh Safety and Health Technology Center and Chairperson of MSHA=s 1992 Coal Mine Respirable Dust Task Group, presented an overview of the Task Group=s key findings and recommendations for improving different aspects of MSHA=s respirable dust program.

Dr. Gregory Wagner addressed the Committee a second time, on the subject of NIOSH=s "Criteria for a Recommended Standard for Occupational Exposure to Respirable Coal Mine Dust." His presentation focused on NIOSH=s rationale for recommending a reduction in the permissible exposure limits for respirable coal mine dust and crystalline silica. He also reviewed NIOSH=s recommendations related to monitoring, controls, training, and medical surveillance.

Following the presentations, the Committee developed a list of issues through an informal process of identifying relevant problems and concerns within the context of the Committee charter. These issues served as a working agenda for the next meeting. Key issues identified included: the need for changes to the PELs for respirable coal mine dust and silica, the need for a separate PEL for silica, the role of continuous monitoring, the design and implementation of ventilation plans, and the need for medical surveillance for surface coal mine workers. The complete list of the issues is contained in Appendix G.

Second Meeting

The Committee held its second meeting in Pittsburgh, Pennsylvania, on April 11 and 12, 1996. The two-day meeting was attended by 33 members of the public, eight of whom elected to address the Committee on the issues under consideration.

On April 10, 1996, prior to their second meeting, the Committee along with some staff members visited the Dilworth Mine, near Washington, Pennsylvania. During their visit, the Committee had the opportunity to observe the various dust controls being employed on the longwall and on a continuous-miner section, and to discuss these controls with mine management, the representative of the miners, and with individual miners. Following the mine visit, the Committee and staff traveled to the PRC=s research facility in Bruceton, Pennsylvania, where

they met with researchers and discussed the state of development of continuous monitoring for respirable dust and the parameters used to control respirable coal mine dust. The Committee was also given a demonstration of these technologies.

In response to input from Committee members following the first meeting, the Chair restructured the issues list to make it more useable (see Appendix H) as a guide for future Committee discussions. The revised issues list was accepted by the Committee as a working document.

The agenda for the second meeting called for the Committee to discuss the issue of the "control of the workplace environment - worker exposure." The Committee discussed MSHA's current sampling protocol, which assesses the exposure of the high-risk occupation; the dust control elements of mine ventilation plans; the basics of such plans; and the process by which MSHA evaluates their suitability and approves such plans. The primary methods of dust control, which are ventilation and water sprays, were discussed in detail, including how dust control parameters are determined to be effective in an individual application.

The Committee also discussed what constitutes "minimum" dust control parameters, and whether information exists that would enable establishing an acceptable margin of error that could lead to practical protective actions by mine operators. The Committee acknowledged that a systematic examination of this question was already undertaken as detailed in MSHA's Task Group Report. However, the Committee also recognized that because of the complexity of the mining process it may not be possible to achieve this goal with a simple objective approach. This is because not only are dust control parameter variables interactive, but also because activities of mine operators may have significant influence on the respirable dust levels. The merits of performance-based standards were considered, along with more targeted recordkeeping of dust parameters and the conditions under which particular parameters are used.

The ability of operators to collect samples other than those required to fulfill the bimonthly requirements was discussed in detail. It was clarified that the regulations do not prohibit an operator from collecting samples for other than compliance purposes. It was explained that the only condition to be met is that an operator must provide MSHA with a list of the cassette numbers that will be used for other than compliance sampling. The Committee also questioned the historical basis of the current practice of citing operators based on the results of their own compliance samples.

Dr. Michael Attfield of NIOSH addressed the Committee in response to a request made by one of its members. NIOSH was asked to re-analyze the Coal Workers' X-ray Surveillance Program (CWXSP) data to establish a baseline, age-related prevalence of abnormal chest x-rays and compare it to CWXSP results. Dr. Attfield explained the limitations of the available data, but agreed to proceed and develop a draft protocol for the Committee's consideration at the next meeting. Some Committee members expressed concern that any new findings resulting from this re-analysis may be difficult to take into consideration because the findings would lack peer review.

Third Meeting

The Committee=s third meeting was held in Charleston, West Virginia, on May 29 and 30, 1996.

The two-day meeting was attended by 74 members of the public, 22 of whom elected to address the Committee on issues under consideration.

As requested at the Committee=s second meeting, Dr. Michael Attfield, NIOSH, briefed the Committee regarding a re-analysis of the CWXSP data referenced by NIOSH in the Criteria Document for respirable coal mine dust. Dr. Attfield discussed how a baseline population from the original surveillance data was selected and used to derive an age and tenure-related background prevalence of x-ray abnormalities. Dr. Attfield explained that it was difficult to draw a meaningful comparison between younger and older miners with similar years of exposure, since the predominant jobs by age groups differ, with the younger miners working at the face and older miners working elsewhere in the mine. According to Dr. Attfield, when comparing the observed prevalence derived from his re-analysis of the surveillance data with that predicted from the original epidemiology study, the excess risk in miners age 30 - 40 was found to be greater than originally predicted (32 in 1,000 vs. 4 in 1,000) and slightly less than predicted for age groups 55-65 (8 in 1,000 vs. 12 in 1,000).

In response to a question of whether NIOSH has in place a program that targets specific intervention strategies, Dr. Gregory Wagner, Director of Respiratory Disease Studies, NIOSH, and a member of the Committee staff, described NIOSH's case-based surveillance studies, and explained that in using this type of surveillance, NIOSH has been unable to identify any single region, state, or coal seam in which to target intervention to prevent either CWP or silicosis. According to Dr. Wagner, the voluntary participation rate in the CWXSP was estimated as 20-35% during Round 5. Dr. Wagner indicated that this rate of participation is unsatisfactory and efforts (e.g. direct mailings to miners= homes) were underway to improve the rate. He stated that based on preliminary results these efforts appear to be having a positive impact.

The subject of miner participation in the CWXSP was discussed again during the public comment period on the first day of the meeting. Mr. Robert Wheeler, a former U. S. Public Health Service officer with NIOSH, discussed a project which he directed in 1982 that was designed to improve miner participation in the surveillance program by providing various incentives, such as issuing hard hat stickers, hats, and belt buckles. Mr. Wheeler told the Committee that it is very difficult to get people to change their behavior, and that there is considerable distrust about the program. According to Mr. Wheeler, the biggest lesson learned from this project was the need to listen to the miners before initiating any program change aimed at improving overall miner participation in the current CWXSP.

A panel representing the National Black Lung Association, an organization comprised of miners, disabled miners, the survivors of miners, and other interested individuals, with 18 chapters across the nation, addressed the Committee. Mr. Mike South, President of the Association, urged the Committee to carefully consider the effectiveness of the current respirable dust standard, sampling process, the role of miners in sampling, and miners education in order to

assure that the health and well-being of miners is better protected. Panel members LaMarse Moore, Julius Dixon, Leslie Blevins, and Ben Vanover, told the Committee of their experience with mining, respirable dust control, operator and inspector sampling and the CWXSP. The panel members said they have been diagnosed with black lung and that they worked in dusty conditions without adequate controls. Following their presentations, Mr. John Cline, a benefits counselor at the Occupational Health Section of the New River Health Center in West Virginia, provided the Committee with some insight into the health problems reported by miners who started mining after 1969. According to Mr. Cline, based on data from West Virginia for a group of 200 miners known to have more than ten years of dust exposure and symptoms, 25 of the 48 miners with confirmed CWP had all of their work time since 1969.

The Committee spent the remainder of the meeting discussing the findings and recommendations drafted during the second meeting in Pittsburgh, Pennsylvania. The areas of consideration included: the use of continuous monitoring, training needs related to dust control portion of ventilation plans, the hierarchy of controls, verification and validation of the dust control portion of the ventilation plan, plan implementation and approval, compliance sampling, single-shift sampling, adjustment of the PEL to account for measurement uncertainty, and what constitutes typical production. The Chair took a "straw vote" on the recommendations related to each of these areas, stating that final voting on recommendations would not take place until the final meeting since members would need to fully understand how the various recommendations interact before being prepared to make a final judgment on each.

At the request of the Chair, Mr. Ron Schell, Chief of the Division of Health for MSHA=s Coal Mine Safety and Health, addressed the Committee on the issue of MSHA=s ability to conduct all compliance sampling. Mr. Schell explained that, in response to the Committee=s discussions, MSHA had examined the current resource situation. Assuming that noncompliance determinations could be made on single-sample measurements, Mr. Schell suggested that MSHA may be able to double the amount of sampling done underground, sample at surface mines at least once a year, and target "problem" mines for sampling approximately four or five times a year. Several Committee members expressed disappointment that MSHA could not assume compliance sampling at a frequency that is equivalent to the current level of operator sampling.

On May 31, 1996, following the conclusion of the third meeting, most of the Committee and staff visited the Hobet No. 21 Surface Mine and Preparation Plant, near Charleston, West Virginia. During the visit, the Committee observed the operation of a variety of surface mining equipment. Committee members discussed the use of this equipment and the particular dust controls in use on the equipment with miners and management personnel. Their input and willingness to explain specific details were particularly helpful to the Committee members in better understanding the mining operation at the Hobet No. 21 Surface Mine and the preparation plant. While at the mine, some of the Committee members had an opportunity to discuss specific aspects of dust control with representatives of Anderson Equipment and Ingersoll Rand. These two companies supply much of the surface equipment used at the mine.

Fourth Meeting

The Committee=s fourth meeting was held in Salt Lake City, Utah on June 20 and 21, 1996. The two-day meeting was attended by 34 members of the public, 10 of whom elected to address the Committee on the issues under consideration. Committee discussions focused on mine ventilation plans, permissible exposure limits, and the application of the CWXSP to surface miners.

On June 19, 1996, prior to their fourth meeting, most of the Committee and staff visited the Deercreek Mine, near Price, Utah. During the visit, the Committee observed dust controls on both a longwall and a continuous-miner section and had the opportunity to discuss the mine=s dust control practices with mine management, the representative of the miners, and individual miners. In preparation for a presentation scheduled for the fourth meeting, the Committee had an opportunity to observe the use of Racal Airstream⁷ helmets,²⁵ a type of powered air-purifying respirator that protects miners from respirable coal mine dust by providing a continuous stream of filtered air across the worker=s face. The members of the Committee discussed the use and maintenance of these devices with the miners who elected to use them, as well as those who did not.

Because of the number and scope of the issues before the Committee, the Chair divided the Committee into two working groups to discuss and develop findings and recommendations on medical surveillance and dust control plans. The working groups met separately during the morning of the first day of the meeting. However, all discussions of the working groups remained open to the public.

Following the meeting of the working groups, the Committee reconvened to discuss the working paper prepared by its working group on medical surveillance. The working paper was modified and adopted for inclusion in the Committee=s working document. The Committee then discussed the paper prepared by the working group on dust control plans. The working paper was then modified and adopted for inclusion in the Committee=s working document.

Mr. David Lauriski, Energy West Mining Company, and Dr. Ragula Bhaskar, Associate Professor, Department of Mining Engineering, University of Utah made a joint presentation to the Committee on the use of Racal Airstream⁷ helmets. Mr. Lauriski gave an overview of his experience and the history of these devices. He urged the Committee to recommend that airstream helmets be recognized as an acceptable environmental control device. Dr. Bhaskar presented the results of research he directed to develop protection factors for the helmets. He presented data showing the results of field tests at four mines. According to Dr. Bhaskar, the

²⁵ Registered trade names are used for identification purposes only and do not constitute an endorsement by the Committee, individual members of the Committee, or the Department of Labor.

helmets, under the conditions tested, afforded an average effective protection of 83.8%.

Mr. Ronald Schell, Chief of the Division of Health for MSHA=s Coal Mine Safety and Health, was again asked to address the Committee on the issue of MSHA=s ability to conduct all compliance sampling. Mr. Schell explained that the sampling program he presented during the third meeting held in Charleston, West Virginia, was the result of staff work. After that meeting, discussions were held between his staff, MSHA managers, and others in the Agency and he was now prepared to present a modified plan. According to Mr. Schell, MSHA would be able to conduct a full-shift sampling inspection during each regular inspection (four annually at underground mines and two annually at surface mines) and also target "problem" mines for sampling at least bi-monthly. Mr. Schell emphasized that these estimates were based on the use of single-shift sampling for making noncompliance determinations.

The remainder of the meeting was devoted to addressing agenda items and no further presentations were made. The Committee discussed the following subjects and modified or prepared findings and recommendations for each: mine ventilation plans, the need for changes to the PELs for respirable coal mine dust and silica, the need for a separate standard for silica, monitoring, research needs, medical surveillance for surface workers, and personal versus environmental sampling.

Fifth Meeting

The Committee=s fifth meeting was held in Lexington, Kentucky on July 22, 23, 24, and 25, 1996. This meeting was held as a working session and therefore no presentations were made except during that portion set aside for public comment. The four-day meeting was attended by 59 members of the public, 32 of whom elected to address the Committee on the issues under consideration.

During this final meeting, the Committee discussed each issue being considered. These issues included: permissible exposure limits (PELs), controls required to achieve exposure limits, sampling practices, medical surveillance, training and education, hazard surveillance, research needs, and reporting by MSHA. From these discussions, the Committee finalized thirty four recommendations requiring voting by the Committee.

In developing consensus recommendations, the Committee operated under a set of ground rules (Appendix I) that defined "consensus" as "a majority of the votes cast are in favor of or against the resolution on an issue" and "majority" as "a simple majority of the votes cast except that abstentions are not counted." The ground rules further stated that: "Members affirming a resolution to an issue need only state their affirmation. Members not affirming a resolution to an issue must state their rationale for their position. Members may abstain from voting and are neither obligated to state the reason for their abstention nor required to propose an alternate resolution." During this meeting, the Committee expended considerable effort in an attempt to reach unanimous agreement on all of the recommendations. The Committee was successful in its efforts on twenty-one votes and there were three other votes where no member voted not to

affirm the recommendation under consideration. A complete summary of the votes cast by the members of the Committee is given in Appendix J of this report.

VI. STATEMENT OF COMMITTEE RECOMMENDATIONS

The Committee was charged with providing recommendations of ways to improve the program to control respirable coal mine dust and silica dust in underground and surface coal mines in the United States. Specifically, the charge of the Committee was to make recommendations to the Secretary for improved standards or other appropriate actions on permissible exposure limits to eliminate black lung disease and silicosis; the means to control respirable coal mine dust levels; improved monitoring of respirable coal mine dust levels and the role of the miner in that monitoring; and the adequacy of the operator's current sampling program to determine the actual levels of dust concentrations to which miners are exposed. The following is a statement of the Committee recommendations.

RECOMMENDATION NO. 1

MSHA should consider lowering the level of allowable exposure to coal mine dust. Any reduction in the level should include a phase-in period to allow allocation of sufficient resources to the compliance effort.

In the interim, the operators, MSHA and miners should develop a comprehensive program to assure compliance with the current permissible exposure level. This effort should include at least targeted compliance efforts, sharing of documented exposure reduction approaches (e.g., increased water sprays, scrubbers on continuous miners, dust control plan parameters), and increased "good faith effort" consideration in enforcement actions.

RECOMMENDATION NO. 2

MSHA should develop and enforce separate PELs for exposure to silica and coal mine dust.

MSHA should explore appropriate methods for determining compliance with exposure limits for mixtures of silica and coal mine dust.

RECOMMENDATION NO. 3

The Committee suggests that MSHA cause the lowering of the silica exposure of miners. In this effort, MSHA should seek input from NIOSH and collaborate with OSHA. However, the Committee recommends that MSHA move forward with these efforts and not await possible action by OSHA. MSHA efforts to lower silica exposures below the current PEL might include rulemaking, targeted compliance efforts, encouragement of operator efforts to lower silica exposures below the current PEL, and more extensive silica hazard surveillance. Additionally, MSHA must confirm the accuracy of its analytical procedures to assure that actual exposures are recognized and documented.

RECOMMENDATION NO. 4

Environmental control measures should continue to be the primary means of maintaining respirable dust levels in the mine atmosphere in the active workings in compliance. Respiratory protective equipment should not replace these control measures but should continue to be provided to miners until environmental controls are implemented that are capable of maintaining the respirable dust level in compliance. Administrative controls should only be utilized in situations similar to respiratory controls--as interim control measures while environmental controls are being installed.

RECOMMENDATION NO. 5

Administrative

MSHA should develop an administrative review process for timely approval of new or revised plans to permit testing of the adequacy of the plan. The process should consider the proposed changes in plan parameters and their potential effectiveness based on available performance data, current or projected operational parameters and production levels, the mine operator's previous history of ability to maintain compliance with the dust standard and plan parameters, and the proposed test schedule to assess the effectiveness of the new or revised plan parameters.

MSHA should define the range of production levels which must be maintained during sampling to verify the plan. This value should be sufficiently close to maximum anticipated production to reasonably assure the operator and the miner that the plan will be effective under typical operations. MSHA should review compliance and production records to determine when there is need for plan modification and verification.

MSHA should develop criteria detailing when plan modification is required. These criteria should include changes in mining conditions, including production.

Operator Verification

MSHA should require operators to collect respirable dust samples to evaluate the adequacy of a new or revised plan under typical mining conditions within 30 days of granting provisional approval of the new or revised plan parameters. If found to be effective, MSHA should extend the provisional approval until MSHA can undertake independent verification of the revised plan.

If not found to be effective, a modified plan should be submitted to MSHA, including documentation of interim methods to control personnel exposure, in order to establish minimum critical control parameters reasonably anticipated to be adequate for dust control under typical mining conditions. Results of operator samples and analyses of these data, along with information on actual production levels and dust control parameters in use during operator monitoring, should be submitted with the modified dust control plan. MSHA should

not issue citations for violation of the applicable dust standard based on this operator verification sampling. Operator inaction to protect miners where dust values are in excess of the PEL should be citable by MSHA.

MSHA Verification

Within 30 days of receipt of operator verification data documenting that the plan is effective, MSHA should, in consultation with the operator, perform scheduled independent dust monitoring to verify the operator's plan.

Final, minimum operating dust control parameters of the dust control plan should incorporate values measured by MSHA during sampling and, if needed, appropriate data from operator sampling.

If the production level at the time of the verification inspection is sufficiently close to the maximum anticipated production in the proposed plan, the production level in the proposed plan should be the approved maximum production level so long as the respirable dust level is at or below the permissible exposure limit. Otherwise, the production at the time of the verification shall be the basis of the approved production level.

Continued Monitoring

MSHA should develop specific performance requirements for operator sampling relative to documentation of continued adequacy of the plan parameters. MSHA should require that the results and monitoring of dust control parameters and production be recorded in order that correlation of dust control parameters with dust measurements is facilitated.

Operator Responsibility

Operator monitoring for compliance with the dust control measures established in the mine ventilation plan should be consistent with the new on-shift examination requirement of ' 75.362(a)(2). Although no recordkeeping is required as part of this examination, the Committee believes that results of such examinations are informative and, therefore, should be recorded and shared with workers who have been properly trained concerning their interpretation and importance. MSHA should further explore the level of detail needed for recorded data.

Whenever on-shift examinations indicate that the plan's minimum requirements are not being complied with, operators should be required to take appropriate corrective action as specified in 30 CFR ' 75.362(a)(2).

Operators should conduct periodic reviews of the adequacy of the dust control parameters stipulated in the mine ventilation plan and make modifications necessary to achieve and maintain compliance with the applicable dust standard.

MSHA Responsibility

MSHA inspections should include a review of recorded parameter data, dust control measures observed in operation and input from miners regarding whether controls and production are representative of usual operations.

MSHA should examine all recorded operational data and information on miner exposure and dust control measures in place as part of the on-going and six-month reviews of the ventilation plan. These reviews should be designed to evaluate the continued effectiveness of the plan.

RECOMMENDATION NO. 6

During this verification visit, miners and their representatives should have the same paid 103(f) walkaround rights as they do under MSHA inspections.

RECOMMENDATION NO. 7

MSHA should specify the circumstances in which dust control plans are needed for surface mines, surface facilities, and surface areas of underground coal mines. MSHA should develop the relevant parameters for surface dust control plans and a process for plan verification.

Dust surveillance should be conducted at surface facilities and each surface area of an underground coal mine by examining locations where dust generation and miners' exposure occurs. When operations/activities not previously covered by a plan as specified in (1) above are found to have exposures at or above 2 the PEL, those operations/activities must be covered by a plan.

The parameters of the approved dust control plan should be verified as part of the operators' daily inspection requirements of 30 CFR 77.1713.

RECOMMENDATION NO. 8

MSHA should complete research (in consultation with other agencies such as NIOSH) to study the relation between indices collected from continuous monitors and the traditional methods of assessing exposure to respirable dust when these different methods are applied to the function of hazard surveillance as well as when developing other potential uses of continuous monitoring data (for example, compliance activity).

Once the technology for continuous dust monitors has been verified, these monitors should be broadly applied in conjunction with other sampling methods for surveillance and

determination of dust control at all MMUs and other locations at high risk of elevated dust exposures.

Once verified as reliable as in (1) above, MSHA should use continuous monitor data for assessing operator compliance efforts in controlling miner exposures, and should consider use of continuous monitor data directly in compliance.

MSHA should take whatever action possible to expedite the development and field testing of a continuous personal monitor to serve a variety of purposes, among them identifying sources and levels of exposure to respirable dust and, as appropriate, for compliance.

RECOMMENDATION NO. 9

In addition to the chest radiographs at the time of employment and then at the specified intervals thereafter, spirometry and questionnaire data should be collected periodically during a miner's employment. Testing with these modalities will allow the identification of those miners with possible early dust-related health effects.

NIOSH should share the findings of the medical surveillance data with MSHA.

A plan should be developed by NIOSH in consultation with MSHA to determine which cases should be followed-up considering, for example, the severity of findings, clustering of abnormalities and the potential for primary prevention. This plan should assure that the confidentiality of the miner is protected.

MSHA should examine the effectiveness of controls operating at work sites represented by these miners.

Miners identified with abnormal screening tests may benefit from appropriate secondary prevention efforts and appropriate miner education regarding the nature of mining-related lung diseases.

Medical testing of underground coal miners should be extended to surface miners.

RECOMMENDATION NO. 10

NIOSH should oversee the provision of confidential periodic medical examination programs for all mine workers including surface miners as specified above in order to achieve at least 85% participation rate. Participation should be promoted with adequate attention to the education of the miners and mine operators regarding the need for this program. The frequency of the periodic examination program should be at least that recommended by the NIOSH Criteria for a Recommended Standard, "Occupational Exposure to Respirable Coal Mine Dust".

In addition, NIOSH should specify performance standards for medical testing; collect data on medical testing, perform ongoing analysis of surveillance data as well as to locate "hot spots", perform field investigations when warranted by hot spots or other surveillance findings in conjunction with MSHA.

MSHA should mandate operator medical examination programs, and supply appropriate MSHA-collected exposure and employment data to NIOSH for surveillance purposes. In cooperation with NIOSH, MSHA should consider what additional exposure or employment data should be obtained from the operator to further the objectives of medical surveillance, and perform field investigations when warranted by hot spots or other surveillance findings.

Mine operators should pay for the mandated medical testing.

Miner participation should be improved by arranging convenient access to examinations, effective education about the purposes of the testing, timely notification of results of the testing, and maintenance of confidentiality. Additional benefit will be gained by promoting the development of effective and accurate exposure classification.

NIOSH should develop a program to track ex-miners and provide them with the same tests available to active miners. The appropriate frequency of such testing will need to be determined.

RECOMMENDATION NO. 11

The results of the Part 90 program should be systematically evaluated to determine its effectiveness. The surveillance data should be developed to allow appropriate comparison between those who do and do not exercise the Part 90 option. The comparison should consider the following: a) the health status as measured by initial and current chest x-ray, b) health status determined by earliest available and current pulmonary function (if any), c) current impairment or disability status, d) measured respirable dust exposure in jobs at time of Part 90 eligibility and in current job, and e) current employment status. These data should be organized for all miners as well as separately according to: a) geographic region (or type of coal and coal rank mined), b) size of mine (in terms of employment and in terms of tons of coal mined/quarter), c) type of mining (underground -- longwall, continuous, conventional -- versus surface), d) union status of miners, and e) age of miner. The annual rate of Part 90 eligibility should be examined by mine to determine whether specific mines experience very high or very low rates. The characteristics of such mines, if any, should be described in the terms noted in this recommendation.

The results of this evaluation of the Part 90 program should be organized and presented to an independent advisory committee for consideration of any recommendations for alteration of the program. Part 90 program characteristics that should be examined for change include: a) criteria for eligibility (degree of chest x-ray abnormality as well as criteria based on other health criteria such as pulmonary function), b) determination of adequate level of reduced

dust exposure to prevent progression of abnormality, c) degree of protection of wage and seniority benefits, d) adequacy in process of informing miners of the Part 90 option and of the consequences of exercising or not exercising it in each specific case, and e) the training associated with dust control and its relationship to Part 90.

RECOMMENDATION NO. 12

MSHA should consider changes to assure that the training program is appropriately structured and staffed to carry out education and training functions related to dust control issues. MSHA should conduct these activities in a manner that provides quality assistance to the mining industry and oversight of training programs. When cases of overexposure occur to respirable dusts, education and training personnel should be assigned to investigate possible failures in the education and training of miners and mining personnel at mines where these overexposures occur. In addition, MSHA should place high priority on filling the director of training position as soon as possible.

It is likely that adequate training cannot be delivered in the current time frames allowed to train, therefore, MSHA should review and consider restructuring as well as expanding its existing training programs to better meet the objective of a workforce with a comprehensive understanding of the potential long-term hazards of dust exposure, able to recognize dust sources and be effective partners with the operators in the routine maintenance of the dust control parameters.

MSHA should evaluate the content, duration, adequacy and methods of training for each content area. The evaluation must specifically include the adequacy of treatment of the following topics which should be included in initial training in addition to annual training.

- X health hazards of respirable coal mine dust overall
- X health hazards of respirable silica dust
- X objectives and content of a model dust control plan
- X the specifics of the dust control plan at the specific mine
- X MSHA process for approval of dust control plan
- X sources of dust generation
- X control of dust sources
- X dust control parameter ranges approved for the mine operations
- X relative effectiveness of various dust control measures included in the plan
- X mechanisms for reporting deficiencies and implementing corrective actions
- X function and importance of monitoring exposure
- X function and importance of medical surveillance, including local resources (e.g., company, NIOSH)
- X how to review reports of exposure monitoring
- X sources of additional information and assistance

The review should also include the methods of delivery; where not currently applied, proven, effective interactive methods of adult learning should be incorporated into program revisions.

Methods of evaluation of knowledge, skills and abilities gained from the training should be consistent with adult learning objectives. A program for evaluation of the long term impact of training should be developed and implemented.

The need for a specific, training program for operators/supervisors in addition to the above should be studied. Training topics might include:

- X the role of the foreman in the dust control plan
- X the implementation of the team approach to dust control
- X the hierarchy of controls

MSHA personnel responsible for monitoring respirable dust at mines should receive similar training as miners/supervisors. In addition, they need to be constantly educated and updated on dust control methods and how they are applied. Their training should include proper procedures on evaluating dust control parameters.

All affected miners and supervisors need to be educated on any changes to respirable dust control plans, as changes are made.

The resulting programs should be used by all certified trainers for training of miners and mine operators.

MSHA should serve as a resource for training materials for the certified trainers.

MSHA should explore ways in which inspectors, during their normal work detail, might function to improve understanding of the role of enforcement activities in control of dust and disease.

MSHA should review, revise, and update the program to train and certify persons for taking dust samples. MSHA should require annual update training for certification and maintenance for the purpose of keeping these persons up to date with sampling methods and regulations, and for maintaining their expertise. If certified persons do not perform their duties properly, MSHA should consider retraining and/or de-certification.

RECOMMENDATION NO. 13

Hazard surveillance guidelines should be developed with the assistance of NIOSH for use by operators in maintaining and improving dust controls. These guidelines should directly and effectively utilize sampling results and measures related to control of respirable dust. These guidelines should specifically identify any trends or exposure levels that indicate deteriorating or marginally adequate conditions. A report of these findings should be included in MSHA's report of respirable dust samples results provided to the operator and to the miners= representative, and alert them that there is a need for a systematic reexamination of the continued effectiveness of existing control measures.

Hazard surveillance guidelines should also be developed for ventilation plan parameters that are regularly reviewed. These should be designed to assist operators in early identification of adverse trends in the parameters that, if not corrected, may cause miners to be exposed to higher dust levels.

RECOMMENDATION NO. 14

MSHA should develop an initiative to ensure the protection of mine construction workers, contract drillers, and other contractor employees with respirable coal mine dust and silica exposures. This effort should include estimation of the types of contractors, number of workers at risk and their levels of exposure; exploration of means of assuring compliance with permissible exposure limits, the use of dust control plans, sampling and training; delineating responsibility of mine operators and contractors in protecting contractor workers; and implementation of compliance activities to protect this sector of mine workers. MSHA should also improve recordkeeping of exposure to dusts, occupational lung disease, and other hazards that occur to workers of construction and other contractors in order to prevent occupational disease and injury.

MSHA should work with NIOSH to expand medical surveillance to appropriate groups of mine contractor workers and to conduct research pertinent to preventing respiratory disease and respirable dust exposures in mine contractor workers.

MSHA should collaborate with OSHA in bringing similar attention to operations such as exploratory drilling, which fall under OSHA jurisdiction.

RECOMMENDATION NO. 15

MSHA=s reliance on dust sampling for compliance should be based on an appropriate balance of personal, occupational, and environmental sampling.

RECOMMENDATION NO. 16

- a. MSHA should adjust the PELs to account for extended work weeks.

MSHA should develop a formal, targeting mechanism for more frequent sampling of mining sections, mining units, and operators found to have a history of noncompliance with the respirable dust standards or sampling procedures.

MSHA should explore innovative ways to enhance its presence in mines for compliance sampling.

The MSHA sample data form should be reviewed to assure that there is adequate space for recording the operating parameters at the time of sampling. The actual parameters should be compared with those in the approved dust control plan as part of the review of results of each compliance inspection.

MSHA should revise the sampling method (e.g. flow rate) to be consistent with recently developed international standards.

A method should be provided to identify the miner on the sample data form.

MSHA should ensure that all respirable dust sampling technology, such as the new continuous monitors being developed, be designed tamper resistant to the maximum extent possible. Further, MSHA should develop education and training material to be delivered to the entire industry concerning the importance of maintaining such equipment in a tamper proof state along with the consequences for failure to do so.

- b. The Committee believes that any MSHA resource constraints should be overcome by mine operator support for MSHA compliance sampling. The Committee recommends that to the degree that MSHA's resources cannot alone serve the objective identified, resource constraints should be overcome by mine operator funding for such incremental MSHA compliance sampling. One means for obtaining this support could be a reasonable and fair operator fee, based on hours worked, or other equivalent means designed to cover the costs of compliance sampling. Any operator fee program should include an accountability system to ensure the uniform applicability of the program throughout the industry. The fee should only be utilized for the specific purposes of required compliance sampling.
- c. The Committee considers it a high priority that MSHA take full responsibility for all compliance sampling at a level which assures representative samples of respirable dust exposures under usual conditions of work. In this regard, MSHA should explore all possible means to secure adequate resources to achieve this end without adverse impact on the remainder of the Agency's resources and responsibilities. Compliance sampling should be carried out at a number and frequency at least at the level currently required of

operators and MSHA. The miner=s representative would be afforded the opportunity to participate in these inspection activities as provided in Section 103(f) of the Mine Act.

Operator compliance sampling in the interim should continue with substantial improvement to increase credibility of the program based on the Committee=s recommendations.

- d. MSHA should increase the number of samples collected by the Agency to determine compliance with respirable dust standards. MSHA should place major emphasis on the use of personal monitoring for determining compliance with PELs. However, MSHA should continue the practice of designated occupation sampling for determining noncompliance.

MSHA should change the compliance sampling program to allow use of single full shift samples for determining compliance.

- e. MSHA should make no upward adjustment to the PELs to account for measurement uncertainty.
- f. MSHA in conjunction with the Department of Labor Solicitors Office should review the current process for investigating and acting on respirable dust practices which result in unrepresentative respirable dust samples and should create a credible, adequately staffed program for such investigations.
- g. Mine operators should continue to measure exposure to respirable dust for DOs, DWPs, and DAs compliance sampling as provided in 30 CFR 70, 71, and 90. Additionally, mine operators should sample as part of plan verification. Operator sampling at surface mines and surface areas of underground mines should be increased to bi-monthly sampling similar to the underground sampling program. Operators should also continue to be allowed to take samples for purposes other than determining compliance. These samples should be clearly identified in the mine such as by using color code.

Abatement of citations based on MSHA or operator samples should require the operators to sample on multiple shifts as currently required.

- h. MSHA should exercise more oversight on operators= sampling methods and management of samples including periodic audits of dust sampling programs.
- i. Samples taken to determine noncompliance should be taken when production is sufficiently close to the Anormal production shift." The production level should be 90 percent of the average production of the last 30 production shifts and MSHA should require the mine operator to maintain the appropriate records.
- j. MSHA should adjust the PELs to account for extended work shifts.

RECOMMENDATION NO. 17

Continuous monitors for dust control parameters should be utilized to evaluate and assess the quality of dust control measures as a part of mine respirable dust control plans.

RECOMMENDATION NO. 18

MSHA should make public a report of the progress toward each of the recommendations provided in the report of the Advisory Committee. An interim report should be provided by September 1997 with a final report issued by September, 1998.

RECOMMENDATION NO. 19

- a. Miners= participation in the interim operator dust sampling program should be increased to provide assurances that a credible and effective dust sampling program is in place. To that end, miners at each mine should select designated representatives who are employed at that mine for compliance sampling. Miners designated as representatives of the miners should be afforded the opportunity to participate in all aspects of respirable dust sampling for compliance at the mine. That participation would include protection against loss of pay as provided under Section 103(f) of the Federal Mine Act.
- b. Miners= representatives should have the right to participate in dust sampling activities that would be carried out by the employer for verification of dust control plans at no loss of pay. Miners= representatives should also have the right to participate in any activities involving any handling of continuous dust monitoring devices or the extraction of data from continuous dust monitoring devices without loss of pay.
- c. Miners= representatives should receive training and certification to conduct respirable dust sampling paid by the employer. Miners= representatives should be afforded the opportunity without loss of pay from the mine operator to participate in the training of the miners.
- d. A description of work activities and dust exposures on sampling days would be provided to the affected miners by those taking the dust samples.
- e. Miners being sampled should receive in writing by mine operators data on their dust exposure along with any pertinent information on the sampling activities and dust control parameters/production rate, etc. once the sample is analyzed. Written data on the dust exposure of miners being sampled along with any pertinent information on the sampling activities and dust control parameters/production rates should be posted on the mine bulletin board.
- f. The Committee recognizes the problem of miner representation and participation in the dust control programs at mines not represented by a recognized labor organization and

recommends that MSHA target such mines for compliance sampling. MSHA targeting should be active in nature and should consider many factors including miner input, compliance history, and medical surveillance data. Given the seriousness of this problem, MSHA should immediately start auditing and appropriately targeting these types of operations.

RECOMMENDATION NO. 20

The NIOSH Criteria Document lists research needs pertinent to coal miner respiratory health and prevention of disease in the following areas: engineering control methods, respiratory protection, sampling devices, sampling strategy, medical screening and intervention, adverse health effects of dust exposure, characterization of dust, and training and education. The primary focus of NIOSH with regard to the prevention of CWP needs to be ongoing analysis of the medical surveillance program data for hot spots, in order to direct primary prevention efforts where they are most likely to be of direct and immediate benefit to miners. To the degree that research activities do not take precedence over or detract from resources devoted to meaningful administration of the medical surveillance program, the Committee concurs with these research needs. The Committee recommends increased funds for research into fundamental and applied aspects of respirable dust control as well as health effects research. In addition to those listed by NIOSH, some Committee members believe that the following specific research should be undertaken in areas pertinent to MSHA responsibilities:

A. Medical and Epidemiologic Research

MSHA should collaborate with NIOSH in assessing long-latency health effects and their risk relationships with quantitative dust exposure estimates in miners who have left the industry.

MSHA should collaborate with NIOSH in research on respiratory health in construction and contract workers with worrisome exposures to respirable coal mine and silica dusts to serve as the basis for continued policy recommendations.

The efficacy and economics of high resolution computerized tomography (HRCT) as a routine confirmatory test in surveillance of coal miners.

Among risk factors already identified by NIOSH in their Criteria Document, coal rank should also be a consideration.

The relative degree of pathology and dust loading in the lungs of deceased miners in the autopsy program, comparing miners who started mining subsequent to 1972 with those with pre-1972 coal mine dust exposure.

MSHA in collaboration with NIOSH should evaluate the impact of silica exposures on adverse health effects among miners, including silicosis among surface miners.

B. Research on Mechanisms of Coal Mine Dust, Generation, and Control

Research is needed to enhance our understanding of the influence of geology and seam characteristics on respirable coal mine dust generation and physical characteristics of coal mine dust needed for development of control technology.

Applied research to enhance the fundamental understanding of coal mine dust generation, entrainment, transport and capture mechanisms.

C. Applied Engineering Control Research

Development of more effective mine dust (including quartz) control systems for modern high production longwalls. These might include new cutting mechanism and tools to reduce dust generation, use of operation practices (face/out-by haulage, headgate cut-out, sprays) to reduce entrainment or use of air distribution systems which create two splits of air (face split, walkway split) along the longwall face to contain dust in the face area.

Development of improved dust control systems for continuous mining units which might include ventilation/spray systems for containing dust to the face area in continuous miner sections and enhance their capture and improved scrubbers for application in continuous-miner sections (higher collection efficiency).

Assessment of sources of dust exposure and dust levels in new mining systems or new mining technology (e.g., continuous miner, diesels, etc.) and development of appropriate control technology.

Development of new technology for airborne dust control utilizing surfactants, change sprays, foams, etc.

D. Dust Sampling Methods and Surveillance

MSHA in collaboration with NIOSH should analyze available data on sampling and dust exposure conditions to identify a sampling strategy that assures representative characterization of respirable dust exposures under usual conditions of work. The strategy should include the number of samples and frequency of sampling in order to provide accurate and unbiased estimates of exposures.

Development of sampling instruments and sampling methodology for continuous monitoring of personal and area exposures.

Assessment of the relationships between personal, area and environmental sampling, and time-averaged and continuously monitored concentrations.

MSHA and the USBM must test and characterize reliable tamper resistant respirable dust monitoring devices that would provide real time information on the mine dust levels and record the actual concentrations over several days. The devices need to be developed for person-wearable use, as well as environmental monitoring on machines and in areas..

E. Information and Training

MSHA and the former USBM should evaluate the effectiveness of techniques of technology transfer. MSHA and the former USBM must develop a program to disseminate to the mining industry, and MSHA personnel responsible for respirable dust plan evaluation and approval information on the various methods of respirable dust control. Additionally, MSHA needs to insist on the implementation of such controls where applicable to control respirable dust as part of mine plan approval.

MSHA, in conjunction with NIOSH, should conduct research regarding the impact of training and effectiveness of different training techniques, which could be used to strengthen training program content and delivering/evaluation methods.

VII. COMMITTEE FINDINGS AND RECOMMENDATIONS

The Committee concludes that although progress towards making mines safer from the health hazards of respirable coal mine dust is substantial, it is not sufficient to achieve the intent of the Coal Act. The Committee believes that the elimination of CWP and silicosis requires a systematic approach incorporating simultaneously: (1) greater reduction of dust generation and entrainment; (2) greater reduction of ambient concentrations through better dust control plans; (3) improved continuous monitoring and dust sampling programs; (4) greater reduction of personal exposures; (5) enhanced training of miners and mine officials on relevant aspects of coal mine dust control; (6) upgraded medical surveillance programs; (7) more rapid intervention programs; (8) enhanced research on continuing vexing scientific, engineering, and medical issues; and (9) continuous critical evaluation of the coal mine respirable dust standard of 2.0 mg/m^3 and the silica standard of $100 \text{ }\mu\text{g/m}^3$.²⁶

The Committee separated this charge from the Secretary into two areas of concern: program design and implementation, and program evaluation. It then developed issues and questions for consideration under each of these areas, and developed specific recommendations relative to each of these issues. The findings and recommendations of the Committee are set out below preceded by the issue and question for consideration. In addition, each recommendation is followed by a conclusion, that is, a statement of how the Committee members voted on that recommendation.

ISSUE I: PERMISSIBLE EXPOSURE LIMITS (PELs)

I A. RESPIRABLE COAL MINE DUST: Should there be a change in the level of allowable exposure to coal mine dust?

FINDING

Respirable coal mine dust is a mixture of particulates of coal, silica, and other mineral and organic materials found in the mine environment. Miners' exposure to excessive amounts of respirable coal mine dust can cause Coal Workers Pneumoconiosis (CWP) or Progressive Massive Fibrosis (PMF). Indeed, in 1969 the surgeon General of the United States estimated

²⁶ The Committee recognizes that MSHA does not currently enforce a separate standard of $100 \text{ }\mu\text{g/m}^3$ for respirable silica. However, the formula used by MSHA to adjust the 2.0 mg/m^3 respirable coal mine dust standard when the quartz content exceeds 5% mathematically limits the current silica exposure to $100 \text{ }\mu\text{g/m}^3$.

that over 100,000 active and retired miners were afflicted with CWP. The Coal Act established the first comprehensive national respirable coal mine dust standard for U.S. coal mines.

The Committee recognizes the all-important role of the respirable coal mine dust standard in the enhancement of the healthful condition of the mine atmosphere. According to the Coal Act, the purpose of standards related to the control of exposure to coal mine dust is ". . . to provide, to the greatest extent possible, that the working conditions in each underground coal mine are sufficiently free of respirable dust concentrations in the mine atmosphere to permit each miner the opportunity to work underground during the period of his/her entire adult working life without incurring any disability from pneumoconiosis or any other occupation-related disease during or at the end of such period." The Coal Act also established that, effective December 31, 1972, ". . . each operator shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings of such mine is exposed at or below 2.0 milligrams of respirable dust per cubic meter of air." The Committee also notes that the current Occupational Safety and Health Administration (OSHA) PEL for respirable coal dust when the silica content is less than 5% is 2.4 mg/m³, that the current TLV-TWA recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) for respirable coal mine dust is 2 mg/m³, and that 100 µg/m³ is the current OSHA PEL and ACGIH recommended TLV-TWA for respirable silica.^{27, 28}

According to a report submitted to Congress on June 16, 1969 by the Department of the Interior on the causation of CWP, it was indicated that the "probability of developing simple pneumoconiosis decreases with decreasing dust concentrations." According to this report, at 7.0 mg/m³, the rate of simple pneumoconiosis per 1000 miners, after 35 years exposure would be 360 (36 percent); at 4.5 mg/m³, the expected rate would be 150 (15 percent); and at 2.0 mg/m³, the expected rate would be 20 (2 percent). "The probability of developing progressive massive fibrosis (complicated pneumoconiosis) also decreases with reduced exposures." For example, at 7.0 mg/m³, the rate per 1000 miners, after 35 years exposure would be 130 (13 percent), at 4.5 mg/m³, the expected rate would be 40 (4 percent), and at 3.0 mg/m³, the expected rate would be 20 (2 percent). These probabilities were based on British medical studies on dose-response relationships extrapolated to various dust concentrations.²⁹ These studies indicated that lifetime exposure levels maintained below the 2.0 mg/m³ limit should prevent advanced CWP or PMF. Analyses showed that coal miners exposed to ≤ 2 mg/m³ for a 35 year working lifetime had essentially no risk of progression of chest x-ray changes to Category 2/1 or higher (including PMF). This evidence seemed to support the interpretation that as long as chest x-ray changes

²⁷ 29 CFR 1910, Table Z-3.

²⁸ American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Indices for 1995 -1996, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1996

²⁹ Legislative History, p 142.

had not advanced beyond CWP Category I there was no risk of further progression to higher categories with exposures $\leq 2.0 \text{ mg/m}^3$.

The significance of these quantitative provisions and their impacts on the coal mining industry were obvious. A U.S. Bureau of Mines survey of 29 mines in the 1968-69 period had found average dust concentrations in excess of 6 mg/m^3 .³⁰ Clearly, a concerted effort by government and industry had to be mounted to bring mines into compliance.

Although recognizing that there is much that still needs to be done, it is pleased with the advances that have been made in dust control in mines. The Committee notes the general decrease in the prevalence of CWP. Over the past quarter century, the total prevalence of CWP has decreased from 11% to under 3%. The total prevalence of PMF has decreased even more dramatically, from about 1% to less than 0.1%. In addition, the mean age for CWP deaths has increased by approximately seven years while the age-adjusted mortality rate has declined nearly 50%. The Committee commends the role of government agencies, miners, mine operators, and equipment manufacturers in achieving these improved conditions.

The understanding of pulmonary disease related to coal mine dust exposure continues to develop. The Committee acknowledges limitations in the currently available studies, for example the problem of random exposure misclassification and of the bias of cross sectional studies, both factors which tend to underestimate the true risk of CWP and PMF in coal miners. One member of the Committee raised concern that the logistic models used do not allow for the possibility of a threshold effect and that projected lifetime attributable risks are highly sensitive to working lifetime assumptions (35, 40, 45 years etc.). The existence of a threshold effect would significantly alter the methodology for predicting health effects of long duration, low exposure levels based on health effects from short term high exposure levels. Nonetheless, the majority of the Committee considered the approaches used in the referenced studies, in particular the cumulative exposure metric and the regression models, to be appropriate and consistent with sound epidemiologic practice. Experimental analytic methods and models continue to be developed (such as those that attempt to consider the importance of non-specific dust-overload on pulmonary clearance mechanisms and threshold models of exposure-response relationships) and the importance of dose rate on disease risk needs to be studied. It can be anticipated, therefore, that our understanding of the disease process will continue to evolve.

³⁰ Legislative History, p 1198.

The majority of the Committee believes that recent studies from the U.S. as well as Great Britain have provided evidence that Category 1 CWP is not always a benign finding.^{31, 32} These studies have demonstrated that, even at exposure levels below 2 mg/m³, Category 1 CWP may progress, and some miners risk developing PMF. There is also evidence of an exposure-response relationship for CWP even for those who begin with no chest x-ray abnormalities. Overall, the findings from the current available data provide evidence that the prevalence of CWP in miners is higher than that anticipated by the Coal Act.

Furthermore, the most recent report based on data from the National Study of Coal Workers Pneumoconiosis (NSCWP) predicts a 45 year working lifetime risk of developing PMF of between 2.9% and 15.5% following exposure to 2.0 mg/m³ coal mine dust, depending on the

³¹ Hurley, J. F. and Jacobsen, M., "Occupational Hygiene Implications of New Results on Progressive Massive fibrosis in Working Coalminers, Annals of the American Conference of Governmental Industrial Hygienists, 145, (1986), 85-89.

³² Hodous T. K. and Attfield, M. D., "Progressive Massive Fibrosis Developing on a Background of Minimal Simple Coal Workers= Pneumoconiosis," In: Proceedings of the VIIIth International Pneumoconiosis Conference, August 23-26, 1988, Pittsburgh, PA, Cincinnati, OH: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHSS (NIOSH) Publication No. 90-108, (1990).

rank of the coal.³³ These predictions are supported by related reports from other examinations of data on coal miners both from the U.S.³⁴ and Great Britain.³⁵ The opportunity to examine those miners exposed exclusively to coal mine conditions since 1972 (and presumably never exposed to respirable coal mine dust above 2 mg/m³) is limited both by the nature of available data and insufficient follow-up time. However, an analysis prepared by NIOSH for the Committee (May 1996) indicated that the risk of Category 1/0+, 2/1+ and PMF, while reduced, was still present and in excess of the age-related background of chest x-ray abnormalities. While less reliable than data from the NSCWP, NIOSH used data from the CWXSP for miners x-rayed between 1990 and 1995, and who had no underground exposure prior to 1972, to provide an analysis of CWP state by state. This analysis indicated that the prevalence of CWP may not be elevated above background in some areas west of Appalachia.

³³ Attfield, M.D. and Seixas, N. S., "Prevalence of Pneumoconiosis and its Relationship to Dust Exposure in a Cohort of U. S. Bituminous Coal Miners and Ex-miners", American Journal of Industrial Medicine, 27, (1995), 137-151.

³⁴ Attfield, M. D. and Morring, K., "An Investigation into the Relationship Between Coal Workers= Pneumoconiosis and Dust Exposure in U.S. Coal Miners," American Industrial Hygiene Association Journal, 53(8), (1992), 486-492.

³⁵ Hurley, J. F. and Maclaren, W. M., "Dust-related Risks of Radiological Changes in Coal Miners over a 40-year Working Life: Report on Work Commissioned by NIOSH," Edinburgh, Scotland: Institute of Occupational Medicine, Report No. TM/87/09, (1987).

As part of the effort to update knowledge about CWP and dust exposures, NIOSH investigated the impact of coal rank on CWP. These analyses provide support both for an effect of coal rank and of coal dust. There is a consistent geographic variability in the prevalence of abnormal chest x-rays among underground coal miners in the United States with a general decrease from east to west. Higher rank coal is associated with an increase in risk of PMF. The analyses of the effect of rank on CWP, however, showed that there was a dose-response relationship for CWP within each of the different coal rank categories.^{36, 37} Thus, while reduction in the permissible coal mine dust level should add important protection against CWP for coal workers who are mining any of the coal ranks, it is unclear whether reduction of exposures even below 1.0 mg/m³ would be sufficient to protect those exposed to coal mine dust from the higher rank coals.

In addition to the evolving understanding of lifetime dust-exposure and chest x-ray changes in coal miners, a great deal of evidence has accumulated that coal mine dust can cause significant decrements in pulmonary function. Two important cross-sectional studies show a dose-related impact of coal mine dust on the forced expiratory volume -1 second (FEV₁)³⁸ and the forced vital capacity (FVC)³⁹ supporting a need to consider control of dust levels to prevent these types of pulmonary effects as well.^{40, 41} The Committee also noted that longitudinal analysis of data from the NSCWP restricted to exposures subsequent to 1972 however, do not demonstrated an excess loss of lung function after a follow-up period of 13-15 years.^{42, 43}

³⁶ Attfield, M. D. and Seixas, N. S., (1995).

³⁷ Attfield, M. D. and Morring, K., (1992).

³⁸ The forced expiratory volume -1 second is the volume of gas which is expired from the lungs in one second by forced expiratory effort, starting from full inspiration (i.e. total lung capacity).

³⁹ The forced vital capacity is a volume of gas representing the total lung capacity, measured by continuing the forced expiration until no more gas can be expired.

⁴⁰ Marine, W. M., Gurr, D., and Jacobsen M., "Clinically Important Respiratory Effects of Dust Exposure and Smoking in British Coalminers," American Review of Respiratory Disease, 137, (1988), 106-112.

⁴¹ Attfield, M. D. and Hodous, T. K., "Pulmonary Function of U. S. Coal Miners Related to Dust Exposure Estimates," American Review of Respiratory Disease, 145(3), (1992), 605-609.

⁴² Seixas, N. S., Robins, T. G., Attfield, M. D., and Moulton, L. H., "Longitudinal and Cross Sectional Analyses of Exposure to Coal Mine Dust and Pulmonary Function in New Miners," British Journal of Industrial Medicine, 50, (1993), 929-937.

⁴³ Henneberger, P. K. and Attfield, M. D., "Coal Mine Dust Exposure and Spirometry in Experienced Miners," American Journal of Respiratory and Critical Care Medicine,

Some Committee members believe that there is an age-related background prevalence of abnormal chest x-ray findings indistinguishable from CWP. This background prevalence has become increasingly significant as the prevalence of true CWP has decreased. One Committee member estimated that, in the first round of the CWXSP, background ACWP@ accounted for approximately 14% of the observed CWP and by round 6 it accounted for approximately 50%. This phenomenon must be considered when evaluating the effectiveness of existing standards.

The Committee recognizes the desirability of evaluating the effectiveness of the 2.0 mg/m³ standard using data from U.S. underground coal miners who started their mining careers subsequent to the current standard. The CWXSP contains the majority of data available regarding the prevalence of CWP among U.S. underground coal miners who started their underground mining under the current standard. These data, however, are surveillance data based on generally low coal miner participation rates, so it is unclear what sub-population of miners they represent. Consequently, NIOSH has not employed these data to any extent to assess the effect of exposures subsequent to 1972, nor have they used these data to develop risk assessments. The risk assessments presented by NIOSH are based predominantly on analysis of the NSCWP data, but the majority of the miners followed in this study had at least some mining experience at dust levels existing prior to the current standard while many had all or the majority of their cumulative exposure under conditions existing prior to the Coal Act.

The Committee recognizes the importance of these questions, especially as they relate to the NIOSH Criteria Document, and the need to answer them adequately. Some Committee members also noted that NIOSH has not performed an economic evaluation, and that the need for performing such an evaluation exists.

The Committee recognizes and is gravely concerned that overexposure to respirable coal mine dust remains a problem. For example, of 5,398 samples analyzed by MSHA between July 1995 and May 1996 (for which there were also silica analyses) approximately 15% of the samples were above 2.0 mg/m³. Exposure data collected by MSHA and analyzed as part of its Coal Mine Respirable Dust Task Group activities indicate that exposures above the current standard of 2 mg/m³ are found in some mines. For example, approximately 20% of the Spot Inspection Program (SIP) and 15% of the Monitoring Inspection Program (MIP) Designated Occupation (DO) samples exceeded 2 mg/m³. The rate of non-compliance was related to mine size,

accounting for about 25% of MMUs at small or medium-sized mines employing less than 125 miners and 10% at large mines. During the SIP the sample collection at continuous miners coincided with unusually low production shifts (10%) compared with operator and regular inspector sampling (3%); no such difference was noted for longwalls. The Task Group data also indicated that dust concentrations for DO cutting machine operators and hand loaders were greater during SIP sampling than reported by operators. These results are similar to those reported by others comparing MSHA and operator sampling results. Following a careful evaluation of sources of error, Seixas adjusted sampling results by up to 0.08 mg/m³ or 4% at the current standard.⁴⁴ In addition, considerable testimony from both active and disabled miners was heard by the Committee. These remarks indicate that some miners continue to work in dust concentrations well in excess of 2.0 mg/m³.

In summary, there is substantial evidence that either a significant number of miners are currently being exposed to coal mine dust at levels well in excess of 2.0 mg/m³ or that the current exposure limit for coal mine dust is insufficiently protective. The Committee believes that, as understanding of the disease process improves, more definitive judgments can be made regarding resolution of whether the 2.0 mg/m³ standard is sufficiently protective. In the interim, however, incentives should be developed (in addition to enforcement for compliance) to reward those mine operators who undertake good faith efforts to control dust levels at or below the 2.0 mg/m³ standard.

RECOMMENDATION NO. 1

MSHA should consider lowering the level of allowable exposure to coal mine dust. Any reduction in the level should include a phase-in period to allow allocation of sufficient resources to the compliance effort.

In the interim, the operators, MSHA and miners should develop a comprehensive program to assure compliance with the current permissible exposure level. This effort should include at least targeted compliance efforts, sharing of documented exposure reduction approaches (e.g., increased water sprays, scrubbers on continuous miners, dust control plan parameters), and increased "good faith effort" consideration in enforcement actions.

CONCLUSION

All members of the Committee affirmed the recommendation.

⁴⁴ Seixas, N. S., "Dust Exposure and Respiratory Disease in U. S. Coal Miners," Doctoral Dissertation, University of Michigan, 1990.

I B. SEPARATE SILICA STANDARD: Should there be a separate silica standard that includes an allowable exposure to airborne silica particulate as well as the related aspects of sampling, controls, medical monitoring and training?

FINDING

Both respirable silica and respirable coal mine dust affect the respiratory system, and both are capable of causing pneumoconiosis, decrement in lung function, and chronic obstructive lung disease. MSHA currently regulates exposures to silica and coal mine dust by reducing the standard for coal mine dust where quartz is present at concentrations above 5% of respirable dust [reduced standard = 10) % silica].

Information reviewed by the Committee demonstrates a continued significant silica exposure hazard in coal mining, especially for some operations such as roof bolting. The Committee also noted that some operations such as surface drilling are regulated by application of the reduced coal mine dust standard, whereas the predominant risk is due to silica exposure. The Committee thus considers it important that separate standards be applied to silica and coal mine dusts. Such a monitoring and compliance framework should aid in targeting mining situations where silica exposure constitutes a significant hazard.

The Committee finds that it is appropriate that the combined effects of exposure to respirable coal dust and silica dust be considered when establishing the PELs, since both contaminants act upon the same organ system. However, the Committee recognizes that a consensus among scientists and physicians does not currently exist as to whether the harmful effects of a combined exposure would be synergistic or additive.

RECOMMENDATION NO. 2

MSHA should develop and enforce separate PELs for exposure to silica and coal mine dust.

MSHA should explore appropriate methods for determining compliance with exposure limits for mixtures of silica and coal mine dust.

CONCLUSION

All Committee members affirmed the recommendation.

I C. RESPIRABLE SILICA: Should there be a change in the level of allowable exposure to silica?

FINDING

The Committee finds that the potential for exposure to silica in coal mines is substantial. Currently, 25 percent of mechanized mining units, 75 percent of roof bolters, and 53 percent of surface designated work positions sampled bimonthly by coal mine operators are required to comply with more stringent respirable dust standards due to the presence of quartz in excess of 5% in coal mine dust samples. These estimates of the extent of quartz exposures may be an underestimate because operator bimonthly samples are not routinely analyzed for quartz. Of the samples analyzed for quartz by MSHA over the last eleven years, 31% of 20,226 continuous miner, 34% of 14,913 roof bolter, 21% of 1,298 longwall shearer operator, and 16% of 1,626 longwall jack setter samples exceeded the current PEL of 100 $\mu\text{g}/\text{m}^3$. Comparable MSHA data for surface coal mines show that 57% of 2,663 highwall drill operator and 33% of 3,457 bulldozer operator samples exceeded the PEL. Coal miner autopsy data has demonstrated a 12.5% rate of silicosis among underground coal face workers and 6.4% for surface miners at underground coal mines.⁴⁵ CWXSP data suggest a significantly increased risk of abnormal chest x-ray findings consistent with CWP or silicosis among miners who have ever worked as a roof bolter.⁴⁶ However, these data may not be representative and have not been linked to exposure estimates. Considerable testimony on this issue from both active and disabled miners was heard by the Committee. These remarks indicated that some miners continue to work in silica concentrations in excess of 100 $\mu\text{g}/\text{m}^3$.

In light of the continued occurrence of silicosis in the mining industry, MSHA has established a special emphasis program. Additionally, OSHA also has recently initiated a special emphasis program on silica in light of continued occurrence of silicosis in other industries.

⁴⁵ Green, F. H. Y, Althouse R., and Weber K.C., "Prevalence of Silicosis at Death in Underground Coal Miners," American Journal of Industrial Medicine, 16, (1989), 605-615.

⁴⁶ Personal correspondence: John P. Gibbs, M. D. to David H. Wegman, M. D., July 16, 1996.

In 1974, NIOSH published a recommended exposure limit of 50 µg/m³, which relied heavily on studies of silicosis among granite workers.⁴⁷ Controversy about these studies has existed concerning x-ray classification methodology, prevalence of pneumoconiosis among those with no exposure, and acknowledged deficiencies in the measurement of pulmonary function that occurred in these studies.^{48, 49, 50, 51, 52, 53, 54, 55} Silicosis is indistinguishable from CWP on a chest x-ray. Therefore, the relative prevalence of these two conditions among current miners cannot be known from chest x-ray data alone. No studies have been published utilizing data

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- ⁴⁷ NIOSH, "Criteria for a Recommended Standard: Occupational Exposure to Crystalline Silica," Cincinnati, OH: U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 75-120, (1974).
- ⁴⁸ Graham, W. G. B., O'Grady, R. V., and Dubuc, B., "Pulmonary Function Loss in Vermont Granite Workers: A Long-term Follow-up and Critical Appraisal," American Review of Respiratory Disease, 123, (1981), 25-28.
- ⁴⁹ Theriault, G. P., Peters, J. M., and Johnson, W. M., "Pulmonary function and Roentengographic Changes in Granite Dust Exposure," Archives of Environmental Health, 28, (1974), 23-27.
- ⁵⁰ Theriault, G. P., Peters, and J. M., Fine, L. J., "Pulmonary Function in Granite Shed Workers in Vermont," Archives of Environmental Health, 28, (1974), 18-22.
- ⁵¹ Musk, A. W., Peters, J. M., Wegman, D.H., and Fine, L. J., "Pulmonary Function in Granite Dust Exposure: a Four Year Follow-up," American Review of Respiratory Disease, 115, (1977) 769-776.
- ⁵² Craighead, J. E. and Vallyathan, N. V., "Cryptic pulmonary lesions in workers occupationally exposed to dust containing silica," Journal of the American Medical Association, 244, (1980) 1939-1941.
- ⁵³ Wegman, D. H., Eisen, E. A., Peters, J. M., "Pulmonary Function Loss in Vermont Granite Workers" (Letter to the Editor), American Review of Respiratory Disease, 128 (1983), 776-777.
- ⁵⁴ Eisen, E. A., Robins, J. M., Greaves, I. A., and Wegman, D. H., "Selection Effects of Repeatability Criterion Applied to Lung Spirometry," American Journal of Epidemiology, 120, (1984), 734-742.
- ⁵⁵ Eisen, E. A., Wegman, D.H., Louis, T. A., Smith, T. J., and Peters, J. M., "A Healthy Worker Effect in a Longitudinal Study of One-second Forced Expiratory Volume (FEV₁) and Chronic Exposure to Granite Dust," International Journal of Epidemiology, 24, (1995), 1154-1162.

from the NIOSH National Coal Workers' Autopsy Study, which may contain information regarding the relative prevalence of these two pneumoconioses among U.S. coal miners.

Since then, additional research has been published that is relevant to the silica permissible exposure limit. Following miners after they have left the industry has allowed documentation of substantial rates of silicosis among those exposed at current permissible levels. For example, a study of South African gold miners which included retirees, showed a 25% risk of silicosis after 28 years of mining at $100 \mu\text{g}/\text{m}^3$ average silica exposure.⁵⁶ A death certificate study of South Dakota gold miners predicted that a 45-year exposure at 90 micrograms/ m^3 would result in a lifetime risk of silicosis of 47%.⁵⁷ Study of Hong Kong granite quarriers indicated that cumulative silica exposure between 1 and 5 mg/m^3 -years led to radiologic silicosis in 32% of men aged 50 and older.⁵⁸ In a study of Colorado miners who had left the hard rock mining industry, estimated exposures using silica measurements (in contrast to respirable dust, assuming a constant proportion of silica) were associated with even higher risks of radiologic silicosis.⁵⁹

⁵⁶ Hnizdo, E. and Sluis-Cremer, G. K., "Risk of Silicosis in a Cohort of White South African Gold Miners," American Journal of Industrial Medicine, 24, (1993), 447-457.

⁵⁷ Steenland, K. and Brown, D., "Silicosis among Gold Miners: Exposure-response Analyses and Risk Assessment," American Journal of Public Health, 85, (1995), 1372-1377).

⁵⁸ Ng, T.P. and Chan, L., "Quantitative Relations Between Silica Exposure and Development of Radiological Small Opacities in Granite Workers," Annals of Occupational Hygiene, 38, (1994), (Supplement 1, Elsevier Science Ltd.: Inhaled Particles VII:857-863).

⁵⁹ Kreiss, K and Zhen, B., "Risk of Silicosis in a Colorado Mining Community," American Journal of Industrial Medicine, (1996), (in press).

In contrast to these studies, there is evidence from Canada by Muir and colleagues^{60, 61} which provide a strongly divergent exposure-response relationship with the South African study. The latter predicted a cumulative risk of silicosis after 40 years at 0.1 mg/m³ of 60%. After a similar account of exposure, however, the Canadian studies would predict a 1.2% risk. The discrepancy between the risk estimate of the Canadian and South African studies remains the subject of considerable interest and debate. While the experience in this country has shown a clear relationship between exposure and the development of silicosis the level of risk reported has varied.^{62, 63, 64, 65}

In addition to silicosis, there is some recent evidence that obstructive airway disease may be related to chronic exposure to average levels of respirable silica that are below the current exposure limit.⁶⁶ The International Association for Research on Cancer is reviewing updated information regarding lung cancer risk associated with silica exposure.

The discrepancy among risk estimates in the variety of studies, the substantial differences in exposure circumstances, and the different types of study endpoints and cohort definitions all provide the basis for considerable interest and debate in the scientific community. This debate will likely intensify as NIOSH works on an updated criteria document for silica. While members of the committee did not share a common interpretation of the recent studies and much disagreement about interpretation of the findings was evident, the Committee believes it is appropriate for NIOSH, MSHA, and OSHA to review the adequacy of the current PEL of silica in light of further research since 1974. There was a consensus of the Committee that regardless

⁶⁰ Muir, D. C. F., 5-11.

⁶¹ Muir, D. C. F., 29-43.

⁶² Steenland, K., (1995).

⁶³ Rice, C. H., Harris, R. L. Jr., Checkoway, H., and Symons, M. J., "Dose-response Relationships for Silicosis from a Case-control Study of North Carolina Dusty Trades Workers," In: Silica, silicosis and cancer. Controversy in occupational medicine. Cancer Research Monographs, Vol.2, 77-86, Goldsmith, D. F., Winn, D. M., and Shy, C. M., Editors, Praeger Press, New York, 1986.

⁶⁴ Graham, W. G. B., Hemenway, D., Ashikaga, T., and Weaver, S., "Radiographic Abnormalities in Vermont Granite Workers Exposed to Low Levels of Granite Dust," Chest, 100(6), (1991), 1507-1514.

⁶⁵ Graham, W. G. B., Weaver, S., Ashikaga, T., and O'Grady, R. V., "Longitudinal Pulmonary Function Losses in Vermont Granite Workers - A Reevaluation," Chest, 106(1), (1994), 125-130.

⁶⁶ Eisen, E. A., (1995).

of the adequacy of the current PEL, miners exposed to silica in excess of the current PEL for long durations are at risk of developing silicosis. MSHA should take steps to control these overexposures in all mines in which they occur. These steps might include rulemaking, targeted compliance efforts, encouragement of operator efforts to lower silica exposures below the current PEL, and more extensive silica hazard surveillance.

RECOMMENDATION NO. 3

The Committee suggests that MSHA cause the lowering of the silica exposure of miners. In this effort, MSHA should seek input from NIOSH and collaborate with OSHA. However, the Committee recommends that MSHA move forward with these efforts and not await possible action by OSHA. MSHA efforts to lower silica exposures below the current PEL might include rulemaking, targeted compliance efforts, encouragement of operator efforts to lower silica exposures below the current PEL, and more extensive silica hazard surveillance. Additionally, MSHA must confirm the accuracy of its analytical procedures to assure that actual exposures are recognized and documented.

CONCLUSION

All Committee members affirmed the recommendation.

ISSUE II: CONTROLS REQUIRED TO COMPLY WITH PERMISSIBLE EXPOSURE LIMITS

II A. HIERARCHY OF CONTROLS: Are changes needed to assure that exposure control measures follow the recognized hierarchy (e.g., first choice engineering, next administrative, and last, use of personal protection devices)?

FINDING

Providing and maintaining a work environment free of excessive levels of respirable coal mine dust is essential to prevent the occurrence of occupational lung disease among coal miners and further progression of disease in those miners with early evidence of its development. According to the Mine Act, respirable dust must be sufficiently controlled to permit coal miners to work over a lifetime without becoming impaired by CWP or any other occupational lung disease. Environmental controls should be the primary means of preventing or minimizing miners' exposure to respirable coal mine dust. The reliance on environmental control measures as the primary means of protecting workers over the past 25 years has resulted in significantly lowering the levels of respirable dust in active mine workings and in decreasing the incidence of occupational lung disease in coal miners. Environmental controls include measures that control the amount of respirable coal mine dust in the air that miners breathe by either reducing dust generation or by suppression, dilution, or capturing the dust. In general, however, improvements in environmental control technology have not kept pace with increases in production technology. The Committee encourages the development and use of improvements in technology to control miners' exposure to respirable coal mine dust.

While the Mine Act and implementing regulations require respirators to be made available to all miners underground when concentrations of respirable dust in excess of the applicable standard are known to exist, the Mine Act specifically prohibits the substitution of the use of respirators for environmental control measures in the active workings. The Committee was reminded by the industry representatives that this prohibition is an interim mandatory health standard which could be changed, if warranted, through rulemaking. However, while acknowledging that advances in personal protective devices (respiratory controls) have been made over the past 25 years, the Committee believes that environmental controls must continue as the primary means of protection for miners.

The Committee saw Airstream⁷ helmets (a type of powered air-purifying device that provides a continuous stream of filtered air across the worker's face) being used by miners at both the Dilworth and Deercreek mines. The Committee discussed use and maintenance of these devices with miners who elected to use them, as well as those who did not. In addition, the Committee heard a presentation on the efficacy of Airstream⁷ helmets at its meeting in Salt Lake City. Data, showing the results of field testing at four mines, indicated that under the conditions tested, the helmets afforded an average effective protection of 83.8%.⁶⁷ In this regard, the industry

⁶⁷ "Effective Protection Factors for Racal Airstream Helmets," The University of Utah,

representatives on the Committee believe that operators who are already effectively controlling dust with environmental controls and who supplement this with the use of Airstream⁷ helmets should benefit and be recognized as making a good faith effort toward compliance.

The use of administrative controls does not reduce the responsibility of the operator to maintain the ambient dust levels in active workings at or below the mandatory level. The current sampling program is designed to ensure this responsibility. While not a substitute for engineering controls, administrative controls, which restrict the amount of time that miners spend in an area with uniform exposure level, can result in lower personal exposures.

RECOMMENDATION NO. 4

Environmental control measures should continue to be the primary means of maintaining respirable dust levels in the mine atmosphere in the active workings in compliance. Respiratory protective equipment should not replace these control measures but should continue to be provided to miners until environmental controls are implemented that are capable of maintaining the respirable dust level in compliance. Administrative controls should only be utilized in situations similar to respiratory controls -- as interim control measures while environmental controls are being installed.

CONCLUSION

All Committee members affirmed the recommendation.

II B. IMPLEMENTATION OF DUST CONTROL PLAN: How should a dust control plan be designed, implemented and evaluated for effectiveness in order to assure that coal mine dust and airborne silica particulate levels are maintained below the PEL?

FINDING

The dust control portion of the mine ventilation plan is the key element of an operator's strategy to control respirable dust in the work environment, thereby limiting miners' exposures and eventually eliminating CWP. Therefore, the initial evaluation, approval, in-mine verification and monitoring to demonstrate the effectiveness of the operator's proposed dust control plan are critical to achieving this end. The Committee believes that the design of initial or new plans and the process by which MSHA evaluates and approves such plans are based on experience and engineering judgment. Although plans submitted by operators are required to be designed to control respirable dust, there is no current requirement that provides for the early in-mine verification of the proposed plan's effectiveness under typical mining conditions. Current regulations, however, prohibit a mine operator from initiating any mining activity without an approved ventilation plan. To enable an operator to commence mining, most proposed plans are either approved immediately or approved provisionally based on engineering judgment and on experience until MSHA can sample for plan effectiveness. Consequently, plans may be implemented that may later be shown not adequate to control respirable dust. To prevent or minimize this from occurring, a review process needs to be developed for provisional approval that is associated with a rapid follow-up testing of the proposed plan or revision to verify its effectiveness for dust control.

While the initial development and review of provisional plans may indicate a reasonable likelihood of maintaining dust concentrations within permissible levels, the adequacy of these plans in maintaining dust levels can be assured only through appropriate monitoring of dust levels under typical mining conditions. Although current MSHA procedures provide for periodic assessment of plan effectiveness by its inspectorate, the Committee questioned their adequacy and timeliness. The Committee believes that such monitoring should occur as soon as possible following approval of the provisional plan. Final approval should be based on results of dust surveillance and monitoring of actual dust control parameters and production levels. The Committee does not consider these samples to be part of the routine hazard surveillance monitoring.

Until validated as being suitable to the conditions and mining system at the mine, the MSHA approval of the dust control portion of the mine ventilation plan should be considered provisional. For the validation of a new plan, the Committee believes that MSHA must perform necessary evaluation in the mine. If the respirable dust level is below the applicable standard, the actual dust control parameters in place during the evaluation should become the minimum operating dust control parameters to be included in the approved ventilation plan. The Committee considers use of average production levels for purposes of plan verification to be

inappropriate. Production levels at the time of validation should be near the upper limit of production for that MMU.

Operator compliance with dust control measures established in the approved mine ventilation plan that have been demonstrated to be effective under typical mining conditions, is essential to preventing overexposures and the occurrence of occupational respiratory disease. Compliance can be achieved through operator monitoring of plan parameters on a regular basis and through appropriate adjustments where needed to maintain those controls. The Committee believes that the new provision of the ventilation rule (' 75.362(a)(2)) requiring operator examination of the dust control parameters prior to the start of production should aid in safeguarding the health of miners by reducing the likelihood of overexposures. The Committee considers on-shift examinations of respirable dust controls an important part of reasonable and prudent respirable dust control strategy. Miner involvement in monitoring plan compliance is essential, as is MSHA oversight during regular and other inspections.

The nature of coal mining, with conditions that can change on a daily basis, has a direct impact on the effectiveness of the ventilation plan and, therefore, the plan may require alteration to maintain respirable dust levels in compliance. This is especially true whenever noncompliance is demonstrated. Currently, however, the operator is not required to routinely include in a revised ventilation plan any alterations in control measures needed to achieve compliance. Since the effectiveness of controls can vary significantly, depending on how, where, and in what combination these controls are employed, proposed revisions to ventilation plans need to be evaluated promptly by MSHA to determine if the new or upgraded plan parameters achieve the desired objective under actual mining conditions. While some plan revisions can be approved based on engineering judgment and experience alone, the adequacy of others under typical mining conditions can be demonstrated only through appropriate sampling. This process must assure that miners are adequately protected during the transition between plans.

In addition to coal production areas, miners may be exposed to high levels of mine dusts where coal is transported, transferred, handled, processed and stored. In areas where maintenance work or construction takes place (such as building overcasts or installing additional roof support following falls of roof) miners may also be exposed to high levels of dust.

RECOMMENDATION NO. 5

Administrative

MSHA should develop an administrative review process for timely approval of new or revised plans to permit testing of the adequacy of the plan. The process should consider the proposed changes in plan parameters and their potential effectiveness based on available performance data, current or projected operational parameters and production levels, the mine operator's previous history of ability to maintain compliance with the dust standard and plan parameters, and the proposed test schedule to assess the effectiveness of the new or revised plan parameters.

MSHA should define the range of production levels which must be maintained during sampling to verify the plan. This value should be sufficiently close to maximum anticipated production to reasonably assure the operator and the miner that the plan will be effective under typical operations. MSHA should review compliance and production records to determine when there is need for plan modification and verification.

MSHA should develop criteria detailing when plan modification is required. These criteria should include changes in mining conditions, including production.

Operator Verification

MSHA should require operators to collect respirable dust samples to evaluate the adequacy of a new or revised plan under typical mining conditions within 30 days of granting provisional approval of the new or revised plan parameters. If found to be effective, MSHA should extend the provisional approval until MSHA can undertake independent verification of the revised plan.

If not found to be effective, a modified plan should be submitted to MSHA, including documentation of interim methods to control personnel exposure, in order to establish minimum critical control parameters reasonably anticipated to be adequate for dust control under typical mining conditions. Results of operator samples and analyses of these data, along with information on actual production levels and dust control parameters in use during operator monitoring, should be submitted with the modified dust control plan. MSHA should not issue citations for violation of the applicable dust standard based on this operator verification sampling. Operator inaction to protect miners where dust values are in excess of the PEL should be citable by MSHA.

MSHA Verification

Within 30 days of receipt of operator verification data documenting that the plan is effective, MSHA should, in consultation with the operator, perform scheduled independent dust monitoring to verify the operator's plan.

Final, minimum operating dust control parameters of the dust control plan should incorporate values measured by MSHA during sampling and, if needed, appropriate data from operator sampling.

If the production level at the time of the verification inspection is sufficiently close to the maximum anticipated production in the proposed plan, the production level in the proposed plan should be the approved maximum production level so long as the respirable dust level is at or below the permissible exposure limit. Otherwise, the production at the time of the verification shall be the basis of the approved production level.

Continued Monitoring

MSHA should develop specific performance requirements for operator sampling relative to documentation of continued adequacy of the plan parameters. MSHA should require that the results and monitoring of dust control parameters and production be recorded in order that correlation of dust control parameters with dust measurements is facilitated.

Operator Responsibility

Operator monitoring for compliance with the dust control measures established in the mine ventilation plan should be consistent with the new on-shift examination requirement of ' 75.362(a)(2). Although no record keeping is required as part of this examination, the Committee believes that results of such examinations are informative and, therefore, should be recorded and shared with workers who have been properly trained concerning their interpretation and importance. MSHA should further explore the level of detail needed for recorded data.

Whenever on-shift examinations indicate that the plan's minimum requirements are not being complied with, operators should be required to take appropriate corrective action as specified in 30 CFR ' 75.362(a)(2).

Operators should conduct periodic reviews of the adequacy of the dust control parameters stipulated in the mine ventilation plan and make modifications necessary to achieve and maintain compliance with the applicable dust standard.

MSHA Responsibility

MSHA inspections should include a review of recorded parameter data, dust control measures observed in operation, and input from miners regarding whether controls and production are representative of usual operations.

MSHA should examine all recorded operational data and information on miner exposure and dust control measures in place as part of the on-going and six-month reviews of the ventilation plan. These reviews should be designed to evaluate the continued effectiveness of the plan.

CONCLUSION

All members of the Committee affirmed the recommendation.

II C. MINER PARTICIPATION DURING PLAN VERIFICATION

FINDING

The Committee recognizes that dust control portion of the ventilation plan is an essential element to control respirable dust in all work environments. The Committee also recognizes that the legislative history of the Mine Act clearly documents the belief that the involvement of the miner is vital to effectively improve the health and safety at our nations mines.

Testimony before the Committee identified clearly that no one has more at stake in the end result of a ventilation plan than the miner. It is essential that the miners be involved in the development, evaluation, verification and monitoring of the plan that intimately affects their health. To not utilize the miners= knowledge of the workplace and in the ventilation plan process would be a great loss. Adequate input can be achieved only if miners are included in the process as a routine part of their work assignment.

To the extent that any miner=s role in the process of implementing a ventilation plan is compromised by insufficient understanding of the dust control program in underground coal mines, this lack should be addressed through appropriately enhanced training, covered elsewhere in the Committee=s findings and recommendations.

RECOMMENDATION NO. 6

During this (plan) verification visit, miners and their representatives should have the same paid 103(f) walkaround rights as they do under MSHA inspections.

CONCLUSION

Six of the Committee members affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation and Dr. Ramani abstained from voting on the recommendation.

In voting not to affirm the recommendation, the representatives of the industry submitted a dissenting opinion for the record. The complete text of this opinion can be found in Section VIII.

II D. DUST CONTROLS FOR SURFACE MINES: Should the implementation of dust controls for surface mines differ from underground mines?

FINDING

The Committee notes that the pattern of dust exposures and the sources of dust are likely to be different in different surface coal mining environments and at surface facilities of underground coal mines. The most common surface coal mining method, strip mining, consists of the following unit operations: land clearing, drilling, and blasting in the overburden, overburden excavation, coal drilling and blasting, coal loading, coal haulage, and reclamation and revegetation. The hauled coal may be washed in a preparation plant, and then transported to the customer. The land clearing, drilling, blasting and overburden excavation activities are associated with the soil and rock strata above the coal seam. The soil and rock strata are the predominant sources of dust. The quartz component of dust is a potentially significant health hazard when work is performed in the overburden. The amount of quartz dust in the air depends on the type of rock and the process. Sandstone can be 100% quartz, granite about 40%, and slate about 30%, by weight. Drilling generates very fine dust, while blasting and excavating also can produce and disperse dust. Coal drilling and blasting and coal loading activities in the coal seam produce airborne particulate where coal dust is the predominant component that may affect the miner=s health. During transportation of the coal in the pit area, the source of dust is the coal seam, and outside the pit area, the source of dust is the haulroad. As much of the equipment in surface mining operations is diesel-powered, the presence of diesel particulates is an additional potential exposure risk.

Distinctly different exposure patterns exist for surface mine employees engaged in the variety of surface operations. For example, those who work in coal preparation areas and maintenance personnel who spend time in a shop environment experience quite different exposure environments. Furthermore, miners who work in outside environments are exposed to changing weather conditions, which can lead to extreme variability in dust conditions. In any case, the steady airflow conditions of underground mines are rarely found in surface mines. The geographic location of mines also has an important impact on exposure circumstances. While the overall surface mining dust exposures are likely to be less severe than those of underground mining, the nature and circumstances of these exposures are different and the opportunities and challenges for their control are also different. For example, types of dust control technology needed to control coal dust may differ from that appropriate for silica dust or diesel particulates. It is important that adequate attention is devoted to protect the miner from the specific hazardous component in the dust exposure that is being controlled.

The Committee notes that feasible and effective engineering controls for most surface mining jobs exist, are commercially available, and some are required by MSHA regulations (30 CFR 72.620). Driller dust can be contained by enclosing and ventilating the drill shaft. Almost all major surface mining equipment (draglines, loaders, drills, trucks, dozers, etc.) are fitted with an operator cab, and it is possible to design these cabs to provide a clean air environment. In the Committee=s visit to a surface mine, while it was noted that filters were used in the ventilation

to the operator's cab, local personnel (operators and miners) were not provided with information on whether the filter was designed to exclude respirable dust or silica. This information was not available on either the filter or the filter packaging. In summary, with regard to dust control at surface mine operations, the Committee believes that these operations have not received a comparable level of attention as compared to underground mine operations.

RECOMMENDATION NO. 7

MSHA should specify the circumstances in which dust control plans are needed for surface mines, surface facilities, and surface areas of underground coal mines. MSHA should develop the relevant parameters for surface dust control plans and a process for plan verification.

Dust surveillance should be conducted at surface facilities and each surface area of an underground coal mine by examining locations where dust generation and miners' exposure occurs. When operations/activities not previously covered by a plan as specified in (1) above are found to have exposures at or above 2 the PEL, those operations/activities must be covered by a plan.

The parameters of the approved dust control plan should be verified as part of the operators' daily inspection requirements of 30 CFR 77.1713.

CONCLUSION

All members of the Committee affirmed the recommendation.

ISSUE III: SAMPLING PRACTICES

III A. UNREPRESENTATIVE SAMPLES

FINDING

The Committee believes that the credibility of the current system of mine operator sampling to monitor compliance with exposure limits has been severely compromised. Over the past 10 years, serious questions have been raised regarding the representativeness of respirable dust levels measured by operators, the handling of filter cassettes, and the changing of work assignments and/or working conditions during sample collection. The Committee did not study these issues in sufficient depth to evaluate each challenge to the operator dust sampling program; however, the Committee did review information gathered by MSHA's Respirable Dust Task Group, was provided summary information on the 150 mining companies or individuals convicted of submitting fraudulent dust samples, and heard numerous reports by miners who brought testimony before the Committee. The Committee also is aware of the decisions of the Federal Mine Safety and Health Review Commission in the "abnormal white center" (AWC) litigation which recognizes the multiplicity of factors which can cause AWCs. All of this convinced the members that the credibility of the system is severely compromised.

Regardless of the reasons for the current system's lack of credibility, the Committee considers that one of MSHA's highest priorities should be to take full responsibility for all compliance sampling, provided that sampling must be at the level and frequency that is currently maintained by the combination of MSHA and operator sampling. This fundamental change in the sampling strategy should not result in a reduction in meaningful health surveillance. Should operator sampling be retained, the lack of credibility of the current program would require that MSHA increase surveillance of the program and take appropriate action to assure that an effective system is in place to investigate practices or actions which would cause unrepresentative dust samples to be submitted.

RECOMMENDATION NO 16f

MSHA in conjunction with the Department of Labor Solicitor's Office should review the current process for investigating and acting on respirable dust practices which result in unrepresentative respirable dust samples and should create a credible, adequately staffed program for such investigations.

CONCLUSION

Eight of the nine members of the Committee confirmed the recommendation. Dr. Gibbs abstained from voting on the recommendation.

III A1. CONTINUOUS MONITORING: Under what circumstances is continuous monitoring of coal mine dust concentration appropriate?

FINDING

Worker exposure to excessive levels of dust can be prevented by implementing a hazard surveillance program that provides mine personnel with current information on actual dust levels in the work environment at all times, and on the status of key dust control parameters. The availability of this information on a real-time basis would then enable mine personnel to focus attention immediately on the need to adjust dust control parameters to avert possible overexposure. The recent development of continuous dust and continuous dust control parameter monitors, which have both direct reading and data recording/processing capabilities, offers the potential to improve monitoring of the work environment significantly and contribute to the effective control of exposure. The Committee believes that these two technological developments, when linked, could be the basis of more effective hazard surveillance than exists currently. The Committee has been informed that ten continuous dust measuring devices will be available in January 1997, for placement in operating underground coal mines by MSHA. However, research is needed before recommending the manner in which continuous monitors can be used for compliance or regulatory purposes.

The utilization of continuous parameter monitoring would provide additional information to the operator, both in real time (instant) and accumulated time (stored data), that the approved ventilation plan relating to dust control practices is being properly implemented and continues to be effective. Water flow and water pressure parameters would provide information concerning the degree or adequacy of dust allayment. Tram speed and cutting time would provide information relative to whether maximum productivity was being achieved. Rate of advancement (progressive distance of coal extraction), along with the accumulative stored data of concentrations could be used to estimate percentage of dust generation per coal extraction.

The continuous read-out exposure levels along with the stored data would provide necessary information to the operator that the dust control practices currently designed were either being implemented per instruction, and/or that immediate changes should be made to those practices to lower exposure.

RECOMMENDATION NO. 8

MSHA should complete research (in consultation with other agencies such as NIOSH) to study the relation between indices collected from continuous monitors and the traditional methods of assessing exposure to respirable dust when these different methods are applied to the function of hazard surveillance as well as when developing other potential uses of continuous monitoring data (for example, compliance activity).

Once the technology for continuous dust monitors has been verified, these monitors should be broadly applied in conjunction with other sampling methods for surveillance and determination of dust control at all MMUs and other locations at high risk of elevated dust exposures.

Once verified as reliable as in (1) above, MSHA should use continuous monitor data for assessing operator compliance efforts in controlling miner exposures, and should consider use of continuous monitor data directly in compliance.

MSHA should take whatever action possible to expedite the development and field testing of a continuous personal monitor to serve a variety of purposes, among them identifying sources and levels of exposure to respirable dust and, as appropriate, for compliance.

RECOMMENDATION NO. 17

Continuous monitors for dust control parameters should be utilized to evaluate and assess the quality of dust control measures as a part of mine respirable dust control plans.

CONCLUSION

Recommendation 8: All members of the Committee affirmed the recommendation.

Recommendation 17: All members of the Committee affirmed the recommendation.

III A2 PERSONAL OR ENVIRONMENTAL SAMPLING: Under what circumstances does area sampling of the coal mine environment provide dust concentration data useful for the protection of coal miner health?

FINDING

The current system of monitoring dust exposure in coal mining by sampling high risk designated occupations (DO), designated areas (DA) and designated work places (DWP) has evolved since the enactment of the Coal Act. This sampling strategy can be related to personal samples, occupational samples and area or environmental samples which are defined as follows:

Personal Sample: A personal sample is one taken in the breathing zone of a miner while performing normal duties for a work shift. The sampling device - pump, hose, cassette - remains with the same miner throughout the work shift. Samples for Part 90 miners are personal samples.

Occupational Sample: An occupational sample is one taken during a work shift on individual workers who perform duties of an occupation. The intent of an occupational sample is to measure exposure for an occupation as if one person performed the duties in that occupation for the duration of the sampled work shift. Samples taken for designated occupations are occupational samples.

Area or Environmental Sample: An area or environmental sample is one taken at a fixed location in an area or environment of interest. It measures the concentration of a contaminant in that area and not necessarily the exposure of any individual. DA samples are area samples.

The Committee considered the mix of samples described above to be a reasonable, systematic approach for the determination of miners' respirable dust exposure and the subsequent control of exposure. Choice of the DO, DA or DWP should be mine specific, taking into account the mining conditions and mining technology, and reviewed periodically.

RECOMMENDATION NO. 15

MSHA's reliance on dust sampling for compliance should be based on an appropriate balance of personal, occupational, and environmental sampling.

CONCLUSION

Seven of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation.

In voting not to affirm the recommendation, the representatives of the industry submitted a dissenting opinion for the record. The complete text of this opinion can be found in Section VIII.

FINDING

Despite the MSHA policy to collect respirable dust samples on each mining section at least annually, the Respirable Dust Task Group reported that only 58% of the 2099 mining sections that were in operation for at least 181 days in fiscal year 1991 were adequately sampled by the Agency.⁶⁸ Innovative methods should be explored to enhance MSHA's presence in mines for compliance sampling. At present, during MSHA inspections conducted for purposes other than dust sampling, inspectors are required to monitor compliance with the approved ventilation plan; however, respirable dust samples are not collected. When samples are collected, the dust data card which accompanies the sample does not currently include the parameters from the dust control plan as these were operating during the sampling (e.g. air quantity and number and distribution of water sprays).

When there is a determination of noncompliance, the mine operator must make appropriate changes in dust control and submit five samples to demonstrate exposure is reduced below the PEL. Over time, this can put a miner at a specific occupation at continued risk of high exposure, even while the average exposure is below the PEL. MSHA is currently not issuing citations based on single samples. The Committee believed that this practice is not protective of miner health; moreover, it is inconsistent with the stated intent of the Coal Act and the Mine Act, which require that exposure be at or below the exposure limit for each shift. It is also inconsistent with procedures used by OSHA at the Department of Labor. The Committee also considered criteria for determining that abatement had been achieved. Because of the changing mine environment, some Committee members believed that abatement sampling should continue to be conducted over five shifts because, in their opinion, multiple samples at or below the PEL are necessary to confirm abatement.

RECOMMENDATION NO. 16d

MSHA should increase the number of samples collected by the Agency to determine compliance with respirable dust standards. MSHA should place major emphasis on the use of personal monitoring for determining compliance with PELs. However, MSHA should continue the practice of designated occupation sampling for determining noncompliance.

MSHA should change the compliance sampling program to allow use of single full shift samples for determining compliance.

RECOMMENDATION NO. 16g

⁶⁸ U.S. Department of Labor, (1992), p30.

Mine operators should continue to measure exposure to respirable dust for DOs, DWPs, and DAs compliance sampling as provided in 30 CFR 70, 71, and 90. Additionally, mine operators should sample as part of plan verification. Operator sampling at surface mines and surface areas of underground mines should be increased to bi-monthly sampling similar to the underground sampling program. Operators should also continue to be allowed to take samples for purposes other than determining compliance. These samples should be clearly identified in the mine such as by using a color code.

Abatement of citations based on MSHA or operator samples should require the operators to sample on multiple shifts as currently required.

CONCLUSION

Recommendation 16d: Seven of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation.

Recommendation 16g: Five of the nine members of the Committee affirmed the recommendation. Dr. Ramani, Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation. Dr. Rice abstained from voting on the recommendation.

In voting not to affirm recommendations 16d and 16g, the representatives of the industry submitted a dissenting opinion for the record. In voting not to affirm recommendation 16g, Dr. Ramani submitted a dissenting opinion for the record. The complete text of these opinions can be found in Section VIII.

III A3 SAMPLING FOR COMPLIANCE AND VERIFICATION: Should operator sampling results be used for evaluating compliance with the PEL? (e.g., instrumentation, sample site selection, quality control and assurance).

Should there be a change in the MSHA rules and procedures for monitoring coal mine dust?

FINDING

MSHA sampling of underground mines is currently conducted in order to: 1) verify the effectiveness of an operator's ventilation plan for dust control, 2) determine compliance with respirable dust standards, and 3) serve as a check of the operator collected compliance samples. The MSHA sampling program also provides information used by MSHA to verify that the correct designated occupation, designated areas, and designated work positions for the operator sampling program are being sampled. MSHA collected samples may be used to lower the dust standard based on the silica content of mine dust.

The Committee believes that one of MSHA's highest priorities must be to restore the confidence of miners and mine operators in the respirable coal mine dust sampling program. Efforts to make respirable dust cassettes more tamper-resistant are a step in the right direction, and the Committee finds it essential that all dust sampling technology, including the new continuous monitors currently being developed, should be as tamper-resistant as possible.

Furthermore, the Committee believes that MSHA should take full responsibility for the tasks of compliance sampling in lieu of the current system under which operators are primarily responsible for carrying out such compliance sampling, augmented by limited MSHA compliance sampling during mine inspections. MSHA compliance sampling must be conducted at the number and frequency of current levels required of both operators and MSHA to ensure the reliability of the program. This effort should not adversely affect the Agency's other responsibilities. In this regard, the Committee is of the view that a number of innovative alternatives exist which would allow MSHA to significantly increase its sampling efforts. In addition, MSHA should explore methods for operator financial support of increased MSHA sampling.

The current sampling program to evaluate respirable coal mine dust exposures in the mining environment represents more than 25 years of Agency experience. The Coal Act required mine operators to take accurate dust samples at periodic intervals using approved sampling devices to measure the amount of respirable dust in the mine atmosphere where miners work or travel. Although amended by the Mine Act, this requirement remains essentially unchanged.

At mines lacking miners' representation, the Committee believes that more aggressive participation in the overall health and safety of the miners by MSHA is warranted. There is a compelling record that supports this need. For instance, there are several cases of criminal prosecution for fraudulent sampling practices at these types of operations.

Dust monitoring from 1970-1980

Mine operator=s sampling program: In 1970, regulations were issued that initiated the first comprehensive operator dust sampling program based on the "high risk" concept developed by the BOM. Under this concept, if the dust concentration of the high-risk occupation (designated occupation, or DO) is at or below the applicable standard, then it is assumed that all other section workers in less risky occupations were protected from excessive concentrations of respirable dust. This procedure is based on the knowledge that there usually is an exposure gradient with higher exposure occurring for workers closer to dust generating sources at the working face. The high risk occupation for each mining method was identified in the regulation based on the data obtained by the BOM during an extensive environmental study conducted in bituminous coal mines between 1968 and 1969. For example, in sections that used continuous mining machines, the regulations specified that the high risk occupation samples be collected "in the working environment of the continuous mining machine operator".

The new sampling provisions put in place in 1970 required each operator to sample over a full shift, portal to portal, the environment of the high risk occupation in each coal-producing section on normal production shifts and at specified intervals, by placing the sampling device on the miner or locating it on the mining machine within 36 inches inby (i.e. between the miner and the working face) the miner=s normal working position. Specifying the particular location of the sampling device was intended to assure that samples representative of respirable dust exposures in the mine environment were collected. Consequently, when sampling the environment of the continuous miner operator, for example, the sampling device remained in that environment for the entire shift, even if the particular miner performing the duty at the beginning of the shift was replaced by another miner during the shift.

In addition to high-risk samples, operators were required to sample each underground miner individually every 120 or 180 days depending on where the individual worked in the mine, or every 90 days for each miner who had a positive chest x-ray for CWP and who elected to exercise the option of transferring to a less dusty area. The additional sampling permitted more frequent monitoring of the dust levels in the mining environment. These individual exposure data were not used for compliance purposes; however, the data were forwarded to NIOSH to develop a comprehensive exposure data base for research purposes. Each sample was accompanied by a completed mine data card which included mine-specific information, such as the mine identification number, the miner=s occupation, and the date of the sample.

Federal government sampling program: The 1970 changes also included a federal government dust sampling program providing for semi-annual respirable dust inspections at each underground coal mine. Inspectors sampled the high risk occupation and other face workers, as well as 10 percent of the non-face workers over a period of two to five complete shifts. Inspectors were also required to conduct frequent spot inspections of active workings to check the overall effectiveness of the operators' dust control and sampling program.

MSHA compliance procedures were revised in 1975, resulting in fewer samples and more focus on establishing proper respirable dust control measures by the operator. Instead of sampling individual occupations over multiple shifts, the revised procedures called for sampling at least one shift in the working environment of at least five different occupations that included the high risk occupation, to assess the effectiveness of the respirable dust control plans.

Dust monitoring since 1980

Mine operator=s sampling program: Following hearings held throughout the coal fields in 1977 and 1978, regulations governing operator sampling were revised. Changes impacting the evaluation of an individual's dust exposure included replacing the requirement that all high risk miners be sampled with the bimonthly collection of one sample in a "designated area" (DA) to measure the dust concentrations in the active working associated with other dust generating sources, such as transfer points. The specific locations where DA samples are required to be collected are identified in the operator's approved ventilation plan. Another change was to increase the frequency of sampling from every 90 days to every 60 days for a miner who had a positive chest x-ray for CWP and who elected to exercise his option of transferring to a less dusty area. Surface mine operators were required to sample certain designated workplaces every two months also, unless they demonstrated consistent exposures at or below the 2 mg/m³ exposure limit, or at or below the reduced standard when more than 5% quartz was present in the dust. As a result of these changes, the overall number of operator samples collected annually decreased from approximately 500,000 to less than 150,000. With the continuing decline in the number of operating mines, the number of mine operator samples has declined to less than 70,000 per year; about two-thirds of these are from underground mines, the remainder from surface mines. Another change was to remove personal identifiers from the dust sample card, due to concerns among miners that the data might be used to characterize the exposure of an individual miner in black lung claims, as opposed to the mine environment.

Federal Government Sampling Program: With the revised regulations, MSHA implemented a new respirable dust sampling strategy for its own inspectors aimed at shifting the emphasis of sampling so that less sampling was done in areas where there was a high level of confidence of compliance, and providing more sampling in areas where there was a history of more frequent exposures above the exposure limit. These targeting efforts, however, did not alter the practice of sampling the environment of at least five different occupations over a single shift. Samples taken by MSHA inspectors were used for four purposes: to determine noncompliance with the standard, to assess the effectiveness of the operator's dust control program, to determine the presence of levels of quartz in the dust which might necessitate a reduced dust standard, and to identify occupations other than the designated occupation (DO) that might be at high risk.

In making its recommendations, the Committee noted that estimates of lung disease risk for coal miners by NIOSH were based on long-term average exposures of 0.5 mg/m³.⁶⁹ The Mine Act

⁶⁹ NIOSH, 1995.

stated that ". . . each operator shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active working of such mines is exposed at or below 2.0 milligrams of respirable dust per cubic meter of air". The Mine Act further defines "average concentration" to mean "...measured over a single shift only, unless the Secretary and the Secretary of Health, Education and Welfare find, in accordance with the provision of Section 101 of this Act that such single shift measurement will not, after applying valid statistical techniques to such measurement, accurately represent such atmospheric conditions during each shift". In developing its recommended exposure limit (REL) for respirable coal mine dust, NIOSH allowed for long-term average exposures expected when the daily exposures are maintained below the REL.⁷⁰ Furthermore, the NIOSH risk estimates were based on the mean exposure values, rather than the upper 95% confidence limit for the mean. Thus, for some miners the risk of adverse effects may be higher. Therefore, in using single full-shift samples for making noncompliance determinations, NIOSH recommended that no upward adjustment of the PEL be made to account for measurement uncertainty.

The current dust sampling program allows for a dust sample collected by an operator to be considered "valid" if the production during the shift during which the sample is collected is 50 percent of the average level reported during the collection of the last five bimonthly samples. For an MSHA collected sample to be considered "valid", the production on the shift during which the sample is collected must be 60 percent of the average production for the last 30 days. Dust generation during a shift is related to the production during that shift. As with sampling for plan verification, the Committee considers the use of average production levels for purposes of making compliance determinations to be inappropriate. The production at the time of compliance sampling should be near normal production levels.

Data reviewed by the Committee showed that work weeks in excess of 40 hours per week and 8 hours per day are now common in the mining industry; these data were consistent with the reports from many miners who spoke to the Committee. Estimates of lung disease risk among coal miners are based on long-term average exposures assuming a typical work week of 8-10 hours per day and a 40-hour work week. The metric used for risk assessments is the cumulative exposure (intensity multiplied by duration) and disease risks are assumed to be a function of cumulative exposure and not to depend on the intensity or duration used to compute the cumulative exposure. Workers who are exposed for more than 40 hours per week experience higher cumulative exposures, given the same intensity of exposure, thus adjustment of the PEL is necessary to maintain exposures at or below the permissible level. Additionally, exposures longer than 8 hours per day result in greater respirable dust deposition for the work shift with a proportionately shorter period of dust clearance prior to the next exposure.

⁷⁰ NIOSH, 1995.

Methods of adjusting PELs to account for unconventional and extended work shifts have been proposed.^{71, 72, 73, 74} NIOSH recommended a REL for respirable coal mine dust of 1 mg/m³ for up to 10 hours per day and a 40-hour work week. The Committee believed that an adjustment should be made to the PEL for extended work weeks. Some Committee members thought the 8-hour PEL should also be adjusted for extended work shifts, within a 40-hour work week. The industry representatives on the Committee expressed the opinion that there is currently inadequate information to determine if shift duration or total hours (i.e. overtime) worked per year are significant factors at today's coal dust exposure levels.

The Committee reviewed the advances in sampling procedures that have occurred since the passage of the Mine Act. The current procedures result from the exposure limit having been based on data from the British Medical Research Council (BMRC). The exposure data used by the BMRC was based on samples taken with a Casella horizontal elutriator. In order to use the 10 mm Dorr-Oliver cyclone, which removes non-respirable dust differently than the elutriator, results from one would have to be converted to the other in order to insure that the dust

⁷¹ Brief, R.S. and Scala, R.A., "Occupational Exposure Limits for Novel Work Schedules," American Industrial Hygiene Association Journal, 36, (1975), 467-417.

⁷² Hickey, J. L. S. and Reist, P. C., "Application of Occupational Exposure Limits to Unusual Work Schedules," American Industrial Hygiene Association Journal, 38, (1977), 613-621.

⁷³ Anderson, M.E., MacNaughton, M. G., Clewell, H. J., and Paustenbach, D. J., "Adjusting Exposure Limits for Long and Short Exposure Periods Using A Physiological Pharmacokinetic Model," American Industrial Hygiene Association Journal, 48, (1987), 335-343.

⁷⁴ Roach, S.A., "Threshold Limit Values for Extraordinary Work Schedules," American Industrial Hygiene Association Journal, 39, (1978), 345-364.

concentration measured by the cyclone operated at 2.0 liters/minute (lpm) would be equivalent to that measured by the elutriator. Thus, with the pump operating at 2.0 lpm, a conversion factor of 1.38 was experimentally derived by operating the two samplers in the same environment and comparing results. This practice differs from both OSHA=s and MSHA=s in the metal/non-metal sector where the 10 mm Dorr-Oliver cyclone is operated at 1.7 lpm. In these situations, there is no need for the conversion.

Utilizing the data base of past sampling results and the data collected by the Respirable Dust Task Group, the Committee believes that MSHA has sufficient information to identify mines or mining units where exposure exceedences are probable, or where respirable quartz exposures are of major concern. The Agency could use these data to develop a scheme to target environmental surveillance efforts.

RECOMMENDATION NO. 16a

MSHA should adjust the PELs to account for extended work weeks.

MSHA should develop a formal, targeting mechanism for more frequent sampling of mining sections, mining units, and operators found to have a history of noncompliance with the respirable dust standards or sampling procedures.

MSHA should explore innovative ways to enhance its presence in mines for compliance sampling.

The MSHA sample data form should be reviewed to assure that there is adequate space for recording the operating parameters at the time of sampling. The actual parameters should be compared with those in the approved dust control plan as part of the review of results of each compliance inspection.

MSHA should revise the sampling method (e.g. flow rate) to be consistent with recently developed international standards.

A method should be provided to identify the miner on the sample data form.

MSHA should ensure that all respirable dust sampling technology, such as the new continuous monitors being developed, be designed tamper resistant to the maximum extent possible. Further, MSHA should develop education and training material to be delivered to the entire industry concerning the importance of maintaining such equipment in a tamper proof state along with the consequences for failure to do so.

RECOMMENDATION NO. 16b

The Committee believes that any MSHA resource constraints should be overcome by mine operator support for MSHA compliance sampling. The Committee recommends that to the

degree that MSHA=s resources cannot alone serve the objective identified, resource constraints should be overcome by mine operator funding for such incremental MSHA compliance sampling. One means for obtaining this support could be a reasonable and fair operator fee, based on hours worked, or other equivalent means designed to cover the costs of compliance sampling. Any operator fee program should include an accountability system to ensure the uniform applicability of the program throughout the industry. The fee should only be utilized for the specific purposes of required compliance sampling.

RECOMMENDATION NO. 16c

The Committee considers it a high priority that MSHA take full responsibility for all compliance sampling at a level which assures representative samples of respirable dust exposures under usual conditions of work. In this regard, MSHA should explore all possible means to secure adequate resources to achieve this end without adverse impact on the remainder of the Agency=s resources and responsibilities. Compliance sampling should be carried out at a number and frequency at least at the level currently required of operators and MSHA. The miner=s representative would be afforded the opportunity to participate in these inspection activities as provided in Section 103(f) of the Mine Act.

Operator compliance sampling in the interim should continue with substantial improvement to increase credibility of the program based on the Committee=s recommendations.

RECOMMENDATION NO. 16e

MSHA should make no upward adjustment to the PELs to account for measurement uncertainty.

RECOMMENDATION NO. 16h

MSHA should exercise more oversight on operators= sampling methods and management of samples including periodic audits of dust sampling programs.

RECOMMENDATION NO. 16i

Samples taken to determine noncompliance should be taken when production is sufficiently close to the Anormal production shift." The production level should be 90 percent of the average production of the last 30 production shifts and MSHA should require the mine operator to maintain the appropriate records.

RECOMMENDATION NO. 16j

MSHA should adjust the PELs to account for extended work shifts.

RECOMMENDATION NO. 19f

The Committee recognizes the problem of miner representation and participation in the dust control programs at mines not represented by a recognized labor organization and recommends that MSHA target such mines for compliance sampling. MSHA targeting should be active in nature and should consider many factors including miner input, compliance history, and medical surveillance data. Given the seriousness of this problem, MSHA should immediately start auditing and appropriately targeting these types of operations.

CONCLUSION

Recommendation 16a: All members of the Committee affirmed the recommendation.

Recommendation 16b: Eight of the nine members of the Committee affirmed the recommendation. Mr. Lamonica abstained from voting on the recommendation.

Recommendation 16c: All members of the Committee affirmed the recommendation.

Recommendation 16e: Five of the nine members of the Committee affirmed the recommendation. Dr. Ramani, Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation. Dr. Rice abstained from voting on the recommendation.

Recommendation 16h: Eight of the nine members of the Committee affirmed the recommendation. Dr. Ramani abstained from voting on the recommendation.

Recommendation 16i: Six of the nine members of the Committee affirmed the recommendation. Dr. Ramani, Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation.

Recommendation 16j: Three of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation. Dr. Wegman, Dr. Dement, Dr. Kreiss and Dr. Rice abstained from voting on the recommendation.

Recommendation 19f: Seven of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation.

In voting not to affirm recommendations 16e, 16i, 16j and 19f, the representatives of the industry submitted dissenting opinions for the record. In voting not to affirm recommendations 16e and 16i, Dr. Ramani submitted dissenting opinions for the record. The complete text of these opinions can be found in Section VIII.

III B ROLE OF MINERS: In what ways can miner participation in eradicating dust-related diseases be improved?

FINDING

The Mine Act contains various measures to protect the health of the Nation=s coal miners. Among these, it sets maximum mine respirable dust exposure levels to which miners can be exposed. The Mine Act also establishes a mechanism for monitoring the dust to ensure that the atmosphere is maintained at a healthy level. To be considered an effective program, both the mine operator and the miner must have a high level of confidence in the dust monitoring process.

The Committee heard testimony from miners who described a number of unfortunate examples where mine dust sampling programs appeared to have been operated improperly. In some mines, dust samples collected by the mine operators were reported to be uncharacteristic. As a result of these instances and related legal cases, it appears that many miners have lost confidence in the dust sampling program. The Committee also heard testimony regarding instances where there was concern with the MSHA sampling program as well.

A concerted effort needs to be undertaken to assure mine operator and miner confidence in the dust sampling process. As part of the effort to assure that appropriate procedures are operating during any dust sampling in mines, the Committee believes that there is a need for increasing the miners= participation during dust sampling.

RECOMMENDATION NO. 19a

Miners= participation in the interim operator dust sampling program should be increased to provide assurances that a credible and effective dust sampling program is in place. To that end, miners at each mine should select designated representatives who are employed at that mine for compliance sampling. Miners designated as representatives of the miners should be afforded the opportunity to participate in all aspects of respirable dust sampling for compliance at the mine. That participation would include protection against loss of pay as provided under Section 103(f) of the Federal Mine Act.

RECOMMENDATION NO. 19b

Miners= representatives should have the right to participate in dust sampling activities that would be carried out by the employer for verification of dust control plans at no loss of pay. Miners= representatives should also have the right to participate in any activities involving any handling of continuous dust monitoring devices or the extraction of data from continuous dust monitoring devices without loss of pay.

RECOMMENDATION NO. 19c

Miners= representatives should receive training and certification to conduct respirable dust sampling paid by the employer. Miners= representatives should be afforded the opportunity without loss of pay from the mine operator to participate in the training of the miners.

RECOMMENDATION NO. 19d

A description of work activities and dust exposures on sampling days would be provided to the affected miners by those taking the dust samples.

RECOMMENDATION NO. 19e

Miners being sampled should receive in writing by mine operators data on their dust exposure along with any pertinent information on the sampling activities and dust control parameters/production rate, etc. once the sample is analyzed. Written data on the dust exposure of miners being sampled along with any pertinent information on the sampling activities and dust control parameters/production rates should be posted on the mine bulletin board.

CONCLUSION

Recommendation 19a: Six of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation. Dr. Ramani abstained from voting on the recommendation.

Recommendation 19b: Seven of the nine members of the Committee affirmed the recommendation. Mr. Lamonica voted not to affirm the recommendation. Dr. Gibbs abstained from voting on the recommendation.

Recommendation 19c: Seven of the nine members of the Committee affirmed the recommendation. Dr. Gibbs and Mr. Lamonica voted not to affirm the recommendation.

Recommendation 19d: All members of the Committee affirmed the recommendation.

Recommendation 19e: All members of the Committee affirmed the recommendation.

In voting not to affirm recommendations 19a and 19c, the representatives of the industry submitted a dissenting opinion for the record. In voting not to affirm recommendation 19b, Mr. Lamonica submitted a dissenting opinion for the record. The complete text of these opinions can be found in Section VIII.

ISSUE IV: MEDICAL SURVEILLANCE AND PART 90

Medical testing for respiratory effects of coal mining serves at least two objectives: the screening of individual miners and the surveillance of coal miner populations. Screening involves the use of medical tests (for pulmonary disease in coal miners this could include symptom questionnaires, pulmonary function tests and chest x-rays) in order to search for previously unrecognized diseases or abnormality in individuals. Surveillance involves the collection of results of the same types of medical tests and their analysis on a population basis. Distinct from medical screening, the goals of surveillance include: a) early identification of evidence of disease that represents new opportunities for prevention, b) definition of the magnitude and distribution of the disease among miners, c) tracking trends in the magnitude of the problem to help assess effectiveness of prevention efforts, d) targeting mines or sections of mines that require increased attention to exposure control, and e) public dissemination of information to permit appropriate policy decisions. The existing medical testing program has largely served the first of these two objectives, but not the second. This is a consequence of low participation rates in this voluntary program, which may relate to the fact that relying on chest x-rays alone may well compromise the effective use of test results to determine impairment.

IV A1. MEDICAL SURVEILLANCE PROGRAM: Should there be changes in the medical surveillance program and the way the data from the program is utilized?

FINDING

Currently the only test routinely offered to active underground coal miners through the government program is the chest x-ray. No program is offered to surface coal miners, despite limited data suggesting that surface coal miners develop CWP. The current program does not include retired miners, thus limiting its ability to ascertain health effects with a long latency. The current program does not provide feedback to mine operators, MSHA or groups of miners with regard to relative CWP prevalence by location. The current coal miner medical testing program mandated by the government begins with a mandatory chest radiograph at the time of employment, and three years thereafter. Medical testing continues for underground coal miners as a voluntary program after the third year, with chest x-rays offered periodically at approximately five year intervals. The government is responsible for certifying facilities offering chest x-rays as well as certifying the plan designs for offering the testing. Current efforts to offer chest x-rays may not be convenient to the miner or the mine operator.

The industry representatives on the Committee estimated that the sensitivity and specificity of the chest x-ray reading are approximately 93% and 84%, respectively, in detecting CWP. With the current prevalence of CWP among US miners, the predictive value of a positive reading is approximately 10%.

NIOSH and some Committee members believe that airways diseases are likely associated with at least as great morbidity and mortality as CWP or silicosis. While the chest x-ray is the principal tool for detecting CWP and silicosis, it is insensitive to detecting early airways diseases, which

requires tests of pulmonary function. The sensitivity and specificity of pulmonary function tests to detect coal dust related functional decrements is unknown, as is the prevalence of abnormal tests among underground miners. The predictive value of an abnormal test is, therefore, also unknown. Nevertheless, the current chest x-ray program, enhanced by pulmonary function testing, has the potential to be useful in the surveillance for coal miner airways disease. Recording the depth of the mine and the altitude of the surface may be useful additional variables to study the relationship of any pulmonary function changes with mining exposures and experiences.

The detection of respiratory disease is improved by collection of information on respiratory symptoms, smoking history and occupational history. These data can be collected through the use of standardized questionnaires which can be either self-administered or interviewer administered. The current program does not include individual miner smoking history or coal dust exposure history, or information regarding the use of personal protective equipment. Individual exposure measurements are important and knowable variables in any surveillance activity attempting to relate a disease endpoint with occupational exposure. Additionally cigarette smoking is an important confounder in any evaluation of respiratory disease.

Population studies of secondary prevention efforts (transfer of workers with abnormal chest x-ray findings to lower dust exposures) have not yet been able to demonstrate a significant impact on the progression of CWP in those transferred workers. Therefore, it is not clear that the risk of an individual miner developing PMF once simple CWP is detected can be substantially affected by lowering the dust exposure. However, transfer of workers with chest x-ray abnormalities to lower exposure environments whenever possible is still a prudent practice .

Although the medical tests and the disease process endpoints for coal dust related diseases do not lend themselves to highly effective medical screening, they do lend themselves to medical surveillance. Early recognition of hot spots where there is increased disease can further primary preventive strategies. Primary prevention (which has been shown to have dramatic results) remains clearly the primary strategy for further reducing the occurrence of coal dust related diseases. The distinction between medical surveillance and medical screening is vague among mine operators, miners and even most physicians. Education will be important to clarify these entirely different processes for all of those involved.

Surveillance is least biased if participation rates are high. Miner participation in voluntary medical testing has been low in many rounds of testing, apart from the initial round. It is not known whether the miner population that is participating in the program is a biased sample of eligible miners, or if it is biased, what the nature of the bias is. Low rates of miner participation in the x-ray surveillance program may arise from contradictory incentives on the part of mine operators, NIOSH, or miners; from under funding of program administration, miner training, facility inspection, and publicity; and from mistrust, low awareness, and poor communication.

Individual miners have a right to medical confidentiality, and mine operators, other miners and MSHA have a need to know where and how much (but not specifically in whom) disease is

occurring in order to take effective preventive actions. The former=s rights can be protected by properly managing the information that addresses the latter=s need to know.

RECOMMENDATION NO. 9

In addition to the chest radiographs at the time of employment and then at the specified intervals thereafter, spirometry and questionnaire data should be collected periodically during a miner=s employment. Testing with these modalities will allow the identification of those miners with possible early dust-related health effects.

NIOSH should share the findings of the medical surveillance data with MSHA.

A plan should be developed by NIOSH in consultation with MSHA to determine which cases should be followed-up considering, for example, the severity of findings, clustering of abnormalities and the potential for primary prevention. This plan should assure that the confidentiality of the miner is protected.

MSHA should examine the effectiveness of controls operating at work sites represented by these miners.

Miners identified with abnormal screening tests may benefit from appropriate secondary prevention efforts and appropriate miner education regarding the nature of mining-related lung diseases.

Medical testing of underground coal miners should be extended to surface miners.

CONCLUSION

All members of the Committee affirmed the recommendation.

IV A2. MEDICAL SURVEILLANCE PROGRAM: Independent Contractors

FINDING

Construction and other contractors to mine operators have workforces with exposures to coal mine dust and silica. The Committee heard testimony which leads it to conclude that MSHA has not focused on this portion of mine workers with regard to dust control plans, training, hazard surveillance, and compliance activities. Similarly, such workers have not generally received the opportunity to participate in medical surveillance.

Challenges exist in extending hazard control and surveillance efforts to these mine construction and other contract workers. For construction workers, conditions of work may change quickly as activities change. Exposures and means of control may not be under the control of the contractor in some work. Locations of work may change frequently, e.g. for contract drillers. Mine construction workers developing mines may do identical work as miners subsequently producing coal for the developed mine, but the means for ventilation and exposure control may not exist. These challenges in hazard surveillance and control require special consideration in MSHA efforts to assure that workers of independent contractors on mining properties are protected from the risks of respirable coal mine and silica dust.

In addition, risk exists for workers in exploratory drilling not done on mine properties. The Occupational Safety and Health Administration (OSHA) has jurisdiction in these instances. Regardless of site, drillers may have high silica exposure, have been shown to have high rates of pneumoconiosis in some regions,^{75, 76, 77, 78} and are at risk for acute and accelerated silicosis.

⁷⁵ Amandus, H.E., Hanke, W., Kullman, G., and Reger, R. B., "A Re-evaluation of Radiological Evidence from a Study of U.S. Strip Coal Miners," Archives of Environmental Health, 39(5), (1984), 346-351.

⁷⁶ Amandus, D. E., Petersen, M. R., and Richards, T.B., "Health Status of Anthracite Surface Coal Miners," Archives of Environmental Health, 44(2), (1989), 75-81

RECOMMENDATION NO. 14

MSHA should develop an initiative to ensure the protection of mine construction workers, contract drillers, and other contractor employees with respirable coal mine dust and silica exposures. This effort should include estimation of the types of contractors, number of workers at risk and their levels of exposure; exploration of means of assuring compliance with permissible exposure limits, the use of dust control plans, sampling and training; delineating responsibility of mine operators and contractors in protecting contractor workers; and implementation of compliance activities to protect this sector of mine workers. MSHA should also improve recordkeeping of exposure to dusts, occupational lung disease, and other hazards that occur to workers of construction and other contractors in order to prevent occupational disease and injury.

MSHA should work with NIOSH to expand medical surveillance to appropriate groups of mine contractor workers and to conduct research pertinent to preventing respiratory disease and respirable dust exposures in mine contractor workers.

MSHA should collaborate with OSHA in bringing similar attention to operations such as exploratory drilling, which fall under OSHA jurisdiction.

CONCLUSION

All members of the Committee affirmed the recommendation

⁷⁷ Piacitelli, G.M., Amandus, H.E., and Dieffenbach, A., "Respirable Dust Exposures in U.S. Surface Coal Mines," Archives of Environmental Health, (45)(4), (1990), 202-209.

⁷⁸ NIOSH, "NIOSH Alert: Request for Assistance in Preventing Silicosis and Deaths in Rock Drillers," Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, DHSS (NIOSH) Publication No. 92-107(1992).

IV B. IMPROVING MINER PARTICIPATION: In what ways can participation in the medical surveillance program be improved?

FINDING

The current chest x-ray program, especially if enhanced by pulmonary function testing, has the potential to serve the purpose of surveillance for coal miner lung disease. Surveillance is least biased if participation rates are high. Miner participation in voluntary medical testing has been low in many rounds of testing, apart from the initial round. NIOSH efforts in the last round to invite participation through home mailings has increased participation, but it remains at less than 40% of eligible miners.⁷⁹ Low participation may arise from difficulty in arranging convenient testing sites; contradictory incentives on the part of mine operators, NIOSH, or miners; from under-funding of program administration; inadequate miner education on the purpose of participation in the tests; or from a more general history of mistrust, low awareness, and poor communication. Interpretation of surveillance results would benefit if information was also available regarding personal and occupational histories, along with information about the use of protective equipment.

Medical screening tests that are limited to active miners curtails the effectiveness of surveillance by failing to ascertain health effects requiring long latency, such as CWP. For silicosis, the majority of cases in miners arise after employment has ceased in the mining industry.⁸⁰

RECOMMENDATION NO. 10

NIOSH should oversee the provision of confidential periodic medical examination programs for all mine workers including surface miners as specified above in order to achieve at least 85% participation rate. Participation should be promoted with adequate attention to the education of the miners and mine operators regarding the need for this program. The frequency of the periodic examination program should be at least that recommended by the NIOSH Criteria for a Recommended Standard, AOccupational Exposure to Respirable Coal Mine Dust".

In addition, NIOSH should specify performance standards for medical testing; collect data on medical testing, perform ongoing analysis of surveillance data as well as to locate "hot spots", perform field investigations when warranted by hot spots or other surveillance findings in conjunction with MSHA.

⁷⁹ Personal communication with Dr. Michael Attfield, NIOSH.

⁸⁰ Hnizdo, E., 1993.

MSHA should mandate operator medical examination programs, and supply appropriate MSHA-collected exposure and employment data to NIOSH for surveillance purposes. In cooperation with NIOSH, MSHA should consider what additional exposure or employment data should be obtained from the operator to further the objectives of medical surveillance, and perform field investigations when warranted by hot spots or other surveillance findings.

Mine operators should pay for the mandated medical testing.

MSHA participation should be improved by arranging convenient access to examinations, effective education about the purposes of the testing, timely notification of results of the testing, and maintenance of confidentiality. Additional benefit will be gained by promoting the development of effective and accurate exposure classification.

NIOSH should develop a program to track ex-miners and provide them with the same tests available to active miners. The appropriate frequency of such testing will need to be determined.

CONCLUSION

All members of the Committee affirmed the recommendation.

IV C. ROLE OF THE PART 90 PROGRAM: Is the Part 90 program accomplishing its goal?

FINDING

Data currently available are insufficient to determine whether the Part 90 program is achieving its goal. It is understood that the Part 90 program was introduced as a "safety net" for coal miners who show evidence of the development of CWP. Control of daily exposure to respirable dust in coal mines to a level not exceeding 2 mg/m^3 was determined necessary to prevent most coal miners from developing PMF. At the time of its introduction, the existing scientific understanding of PMF was that it could be prevented if Category 2 x-ray changes were prevented. The exposure level was selected based on statistical models derived from the best scientific evidence available at the time. There have been some cases in which PMF has evolved in miners who only reach the level of Category 1 prior to developing PMF.

When this exposure level was adopted, it was understood that some miners would experience risk even at these levels. In order to prevent these miners from developing illness or disability associated with the new dust exposure limits, a "safety net" was designed, one component of which was the Part 90 program. When medical screening evidence indicated a miner had been adversely affected by exposure to respirable dust, the miner was to be provided the option to work in a low dust environment, and to have increased personal dust monitoring. Since 1969, only 2276 of 8637 eligible miners have exercised the Part 90 option. According to MSHA, only 59 miners are participating in this program at the present time. While this is a small proportion, no systematic evaluation has been undertaken to determine whether those not exercising the option have been adequately informed about their rights, whether they are experiencing undue risk by continuing in their current jobs, or whether those who have chosen to exercise the option achieve reduced risk by moving to a reduced dust job. In addition, a number of part 90-eligible miners at UMWA-represented mines have elected to exercise their superseniority rights under the collective bargaining agreement instead of their Part 90 option. Therefore, there is insufficient evidence to conclude whether or not improvements in the presentation or operation of the Part 90 option are needed.

RECOMMENDATION NO. 11

The results of the Part 90 program should be systematically evaluated to determine its effectiveness. The surveillance data should be developed to allow appropriate comparison between those who do and do not exercise the Part 90 option. The comparison should consider the following: a) the health status as measured by initial and current chest x-ray, b) health status determined by earliest available and current pulmonary function (if any), c) current impairment or disability status, d) measured respirable dust exposure in jobs at time of Part 90 eligibility and in current job, and e) current employment status. These data should be organized for all miners as well as separately according to: a) geographic region (or type of coal and coal rank mined), b) size of mine (in terms of employment and in terms of tons of coal mined/quarter), c) type of mining (underground -- longwall, continuous, conventional -- versus surface), d) union status of

miners, and e) age of miner. The annual rate of Part 90 eligibility should be examined by mine to determine whether specific mines experience very high or very low rates. The characteristics of such mines, if any, should be described in the terms noted in this recommendation.

The results of this evaluation of the Part 90 program should be organized and presented to an independent advisory committee for consideration of any recommendations for alteration of the program. Part 90 program characteristics that should be examined for change include: a) criteria for eligibility (degree of chest x-ray abnormality as well as criteria based on other health criteria such as pulmonary function), b) determination of adequate level of reduced dust exposure to prevent progression of abnormality, c) degree of protection of wage and seniority benefits, d) adequacy in process of informing miners of the Part 90 option and of the consequences of exercising or not exercising it in each specific case, and e) the training associated with dust control and its relationship to Part 90.

CONCLUSION

All members of the Committee affirmed the recommendation.

ISSUE V: TRAINING AND EDUCATION: Should there be changes in training for miners, inspectors, and others responsible for air sampling, data interpretation and implementation and maintenance dust controls.

FINDING

Education and training of miners and sample collectors are vital components of any health protection strategy aimed at eliminating occupational lung disease among coal miners.

MINERS:

The Committee recognizes that 30 CFR Part 48 requires new miner training and annual refresher training on various topics involving the purpose of making dust measurements and on any health related control plan in effect at the mine. Additional training is also required by ' 75.370 of the regulations on provisions of a new or revised ventilation plan prior to its implementation. Both the miner and mine management should be fully knowledgeable about the nature of the dust hazard in the work environment, the various sources of dust generation, the relative effectiveness, proper use, mechanisms for implementing corrective actions, and maintenance of the dust control measures required in the mine ventilation plan, as well as the function of the operator's monitoring program in exposure control.

Notwithstanding these established requirements for training, miners appear to lack the level of understanding of dust-related hazards necessary to assure that routine, ongoing efforts are made to avoid exposure and maintain dust controls. For example, according to the Respirable Dust Task Group Report: "Interviews conducted during the recent spot inspection program indicate that miners are not fully knowledgeable about certain aspects of the dust program. For example, during these interviews, 30 percent of the miners interviewed did not know the parameters included in the mines dust control plan, although this is a topic specifically required to be covered by the operator in the Part 48 training. Miners whose occupations were sampled were asked what they were required to do with the sampling pump when they changed jobs. Thirty-three percent of the miners interviewed responded incorrectly to this question. Other spot inspection data indicate a lack of miner knowledge of hazards associated with respirable coal dust and of the dust control plan parameters, and a failure of personnel to follow correct sampling procedures." ⁸¹ MSHA should use the information developed by the Task Group as the basis for an initial review of the content of the current training programs.

MSHA training personnel currently report to the District Manager, who is charged with overseeing compliance activities. The Committee feels that training personnel should report to

⁸¹ U.S. Department of Labor, (1992), p35.

the director of training, a position which has been filled by an acting director for the past four years. Active efforts to fill the position permanently are encouraging.

Substantial Part 48 training delivery is conducted through a States Grant Program. MSHA reviews the Part 48 requirements in its annual call for proposals under the program and provides areas of emphasis on emerging issues. The 1996-97 program application request specifically asks for inclusion of the health effects of silica in training.

The State awardees are brought to the Academy annually in an effort to provide uniformity in training content and delivery. The State personnel compare experiences as part of a program evaluation.

The evaluation of training programs at completion and the long-term impact of training in workplace settings including mining have been the focus of a number of reports.^{82, 83, 84, 85} The

⁸² Berger, P. K., Gunto, S. J., Haley, J. V., and Rice, C., "Estimating the Impact of Health and Safety Training Using the Retrospective Pretest Design, Applied Occupational Environmental Hygiene, (in press).

⁸³ Gotsch, A. R. and Weidner, B. L., "Strategies for Evaluating the Effectiveness of Training Programs," Occupational Medicine: State of the Art Review, 9, (1994), 171-188.

⁸⁴ Votjecky, M. A. and Schmitz, M. F., "Program Evaluation and Health and Safety Training," Journal of Safety Research, 17, (1986), 57-63.

⁸⁵ Caparaz, A., Rice, C., Graumlich, S., and Radike, M., Development and Evaluation of a Health and Safety Training Program for Foundry Workers," Applied Occupational Environmental Hygiene, 5, (1990), 595-603.

Committee feels that a focus on evaluation would improve the content and delivery of programs by identifying deficiencies which can be remedied by program modification. Any impact of low literacy on training success can be assessed as part of a comprehensive evaluation effort.

SAMPLE COLLECTORS:

The Committee believes that the program to train and certify persons for sampling respirable dust must be strengthened. While MSHA publishes the certification examinations as well as answers to the examination questions, no formal classroom training is required prior to taking the examination. Accordingly, a person who has passed the examination may not possess the necessary level of knowledge and competence intended by the regulations. Such a lack of requisite knowledge is evidenced by the results of interviews of certified dust samplers during the recent spot inspection program. Some 34 percent of the samplers interviewed did not know how often a dust pump must be calibrated under the regulations.⁸⁶

Certified persons perform an important function in providing a healthful environment and should be aware of the magnitude of this responsibility. Therefore, the test should be designed to also evaluate their knowledge of ethical or legal obligations. This has become a particularly sensitive issue in light of the concerns with the dust sampling program.

Once a person has been certified, the integrity of the program depends on that person continuing to fulfill the regulatory requirements in a competent and honest manner. Certified persons who do not comply with the regulations or who otherwise fail to carry out their responsibilities should no longer be certified. However, there is no ongoing process in place to assess the quality of the certification program under existing regulations and procedures. Certifications are valid indefinitely, and no refresher training is required to maintain certification. Moreover, the Agency has no formal criteria defining the type of conduct that may warrant decertification action. Although MSHA has initiated decertification proceedings on an ad hoc basis against a small number of individuals, the lack of formal procedures for decertification may inhibit prompt Agency action.

The Committee recognizes that substantial other training requirements exist in order to assure safe working in the mine environment. These additional recommendations for training elements must be carried out within the overall context of the training program developed by the operator.

The training and education of miners must be recognized as an essential element in achieving control, since it is the miners who are present throughout the shift and can alert the operator to changes in operating parameters which indicate decreasingly effective controls, prior to outright failure of the dust controls. The Committee believes that, through the mining Academy, MSHA has an established mechanism for the development and effective delivery of such training.

⁸⁶ U.S. Department of Labor, (1992), p34.

RECOMMENDATION NO. 12

MSHA should consider changes to assure that the training program is appropriately structured and staffed to carry out education and training functions related to dust control issues. MSHA should conduct these activities in a manner that provides quality assistance to the mining industry and oversight of training programs. When cases of overexposure occur to respirable dusts, education and training personnel should be assigned to investigate possible failures in the education and training of miners and mining personnel at mines where these overexposures occur. In addition, MSHA should place high priority on filling the director of training position as soon as possible.

It is likely that adequate training cannot be delivered in the current time frames allowed to train, therefore, MSHA should review and consider restructuring as well as expanding its existing training programs to better meet the objective of a workforce with a comprehensive understanding of the potential long-term hazards of dust exposure, able to recognize dust sources and be effective partners with the operators in the routine maintenance of the dust control parameters.

MSHA should evaluate the content, duration, adequacy and methods of training for each content area. The evaluation must specifically include the adequacy of treatment of the following topics which should be included in initial training in addition to annual training.

- X health hazards of respirable coal mine dust overall
- X health hazards of respirable silica dust
- X objectives and content of a model dust control plan
- X the specifics of the dust control plan at the specific mine
- X MSHA process for approval of dust control plan
- X sources of dust generation
- X control of dust sources
- X dust control parameter ranges approved for the mine operations
- X relative effectiveness of various dust control measures included in the plan
- X mechanisms for reporting deficiencies and implementing corrective actions
- X function and importance of monitoring exposure
- X function and importance of medical surveillance, including local resources (e.g., company, NIOSH)
- X how to review reports of exposure monitoring
- X sources of additional information and assistance

The review should also include the methods of delivery; where not currently applied, proven, effective interactive methods of adult learning should be incorporated into program revisions.

Methods of evaluation of knowledge, skills and abilities gained from the training should be consistent with adult learning objectives. A program for evaluation of the long term impact of training should be developed and implemented.

The need for a specific, training program for operators/supervisors in addition to the above should be studied. Training topics might include:

- X the role of the foreman in the dust control plan
- X the implementation of the team approach to dust control
- X the hierarchy of controls

MSHA personnel responsible for monitoring respirable dust at mines should receive similar training as miners/supervisors. In addition, they need to be constantly educated and updated on dust control methods and how they are applied. Their training should include proper procedures on evaluating dust control parameters.

All affected miners and supervisors need to be educated on any changes to respirable dust control plans, as changes are made.

The resulting programs should be used by all certified trainers for training of miners and mine operators.

MSHA should serve as a resource for training materials for the certified trainers.

MSHA should explore ways in which inspectors, during their normal work detail, might function to improve understanding of the role of enforcement activities in control of dust and disease.

MSHA should review, revise, and update the program to train and certify persons for taking dust samples. MSHA should require annual update training for certification and maintenance for the purpose of keeping these persons up to date with sampling methods and regulations, and for maintaining their expertise. If certified persons do not perform their duties properly, MSHA should consider retraining and/or de-certification.

CONCLUSION

All members of the Committee affirmed the recommendation.

ISSUE VI: HAZARD SURVEILLANCE: Should MSHA develop and implement a hazard surveillance program? (e.g., a program to examine and act on trends in results of monitoring both dust levels and controls)

FINDING

Mining conditions, which can change significantly from one day to another because of the dynamic nature of mining, directly impact the effectiveness of the measures in place to control respirable dust. Failure to promptly detect when existing dust controls become ineffective may needlessly expose miners to higher dust levels. This can be prevented or minimized through regular review of sampling and parameter data as part of hazard surveillance program. Such a program will permit the operator to evaluate plan adequacy on an ongoing basis to determine whether the stipulated controls continue to be effective or whether a modification to the plan is needed.

With effective hazard surveillance tools, designed to trigger specific action, the required on-shift examination of dust control measures along with the personal sampling and continuous monitoring provide an excellent means for targeting operations that require more effective and consistent control of coal mine dust. Effective hazard surveillance can also focus attention at the earliest possible time on the need to improve control parameters before permissible dust exposure levels are exceeded. The Committee believes that implementation of a hazard surveillance program will assist mine operators in achieving a sound occupational health protection strategy.

The program should be designed as a set of guidelines by MSHA for implementation by operators who have access to the necessary data on a daily basis.

RECOMMENDATION NO. 13

Hazard surveillance guidelines should be developed with the assistance of NIOSH for use by operators in maintaining and improving dust controls. These guidelines should directly and effectively utilize sampling results and measures related to control of respirable dust. These guidelines should specifically identify any trends or exposure levels that indicate deteriorating or marginally adequate conditions. A report of these findings should be included in MSHA's report of respirable dust samples results provided to the operator and to the miners' representative, and alert them that there is a need for a systematic reexamination of the continued effectiveness of existing control measures.

Hazard surveillance guidelines should also be developed for ventilation plan parameters that are regularly reviewed. These should be designed to assist operators in early identification of adverse trends in the parameters that, if not corrected, may cause miners to be exposed to higher dust levels.

CONCLUSION

All members of the Committee affirmed the recommendation.

ISSUE VII: RESEARCH NEEDS

FINDING

MEDICAL AND EPIDEMIOLOGIC RESEARCH

The x-ray surveillance program, even assuming high participation rates, will be limited in generating further exposure-response information for CWP, since many miners likely develop radiologic abnormalities after they leave the industry. To avoid underestimation of disease burden associated with particular mining exposures, follow-up of ex-miners is critical, as has been shown in the hardrock mining industry.

Little population-based information exists for surface miners to support policy recommendations for their protection, although sentinel events of accelerated silicosis among this group make action imperative.

ENGINEERING RESEARCH

The Committee finds considerable evidence that research into the generation, entrainment, transport and control of airborne respirable coal mine dust since 1969 has been effective. The research has significantly contributed to the reduction in the ambient respirable dust concentration. However, the Committee notes that the respirable dust control sampling program has found that a large number of samples collected underground have concentrations exceeding the mandated levels. The Committee has also concluded that the advancements in respirable dust control technology have not kept pace with advancements in production technology. There is also reason to believe that the technology for quartz dust control in mines is not adequate. Therefore, the Committee finds a significant need to accelerate research and development into the generation, entrainment, suppression, and sampling of respirable coal mine dust.

The Committee also concluded that a dust sampling device which could provide reliable constant information on the respirable dust levels to miners and mine operators along with a recording of the actual levels over a period of time could be utilized to improve the respirable dust levels at coal mines.

The Committee found that MSHA and the Mining Health and Safety Research Division of the PRC was finalizing the development of such devices to be machine mounted and area mounted. They also found that the agencies were working on the development of a similar dust sampling device to attach to the individual.

The Committee notes that the subject of respirable dust control in mines has been studied in the past by Committees of the National Research Council. The Committee notes with concern the inadequate amount of resources currently committed to resolving the fundamental aspects of the respirable dust control program, and the potential for further reduction of the present research base of personnel and facilities.

The Committee recognized that the methods of respirable dust control which have been developed are not as widely understood as they should be in the mining industry. Additionally the implementation of new technology may be delayed due in part to a lack of dissemination of the information in the mining industry, and in part due to operational and economic decisions not to utilize them. For instance, while some mine operators utilize water sprays on longwall shields, which have been shown to be a reliable dust control, other operators do not.

It is important for miners to participate in conceiving, conducting, and interpreting the results of R&D research. Miners have extensive practical knowledge about the operation of coal mines and this knowledge should be available to anyone doing research and development in the mines.

In general, the Committee notes that the level of funding for respirable dust research has proven to be inadequate to achieve, in a reasonable time, the intent of the 1969 Act and recommends that increased funds be specifically allocated for research into the fundamental and applied aspects of coal mine respirable dust control. This funding is necessary to rapidly enhance the protection afforded miners.

RECOMMENDATION NO. 20

The NIOSH Criteria Document lists research needs pertinent to coal miner respiratory health and prevention of disease in the following areas: engineering control methods, respiratory protection, sampling devices, sampling strategy, medical screening and intervention, adverse health effects of dust exposure, characterization of dust, and training and education. The primary focus of NIOSH with regard to the prevention of CWP needs to be ongoing analysis of the medical surveillance program data for hot spots, in order to direct primary prevention efforts where they are most likely to be of direct and immediate benefit to miners. To the degree that research activities do not take precedence over or detract from resources devoted to meaningful administration of the medical surveillance program, the Committee concurs with these research needs. The Committee recommends increased funds for research into fundamental and applied aspects of respirable dust control as well as health effects research. In addition to those listed by NIOSH, some Committee members believe that the following specific research should be undertaken in areas pertinent to MSHA responsibilities:

A. MEDICAL AND EPIDEMIOLOGIC RESEARCH

MSHA should collaborate with NIOSH in assessing long-latency health effects and their risk relationships with quantitative dust exposure estimates in miners who have left the industry.

MSHA should collaborate with NIOSH in research on respiratory health in construction and contract workers with worrisome exposures to respirable coal mine and silica dusts to serve as the basis for continued policy recommendations.

The efficacy and economics of high resolution computerized tomography (HRCT) as a routine confirmatory test in surveillance of coal miners.

Among risk factors already identified by NIOSH in their Criteria Document, coal rank should also be a consideration.

The relative degree of pathology and dust loading in the lungs of deceased miners in the autopsy program, comparing miners who started mining subsequent to 1972 with those with pre-1972 coal mine dust exposure.

MSHA in collaboration with NIOSH should evaluate the impact of silica exposures on adverse health effects among miners, including silicosis among surface miners.

B. ENGINEERING RESEARCH

Research on Mechanisms of Coal Mine Dust, Generation, and Control

Research is needed to enhance our understanding of the influence of geology and seam characteristics on respirable coal mine dust generation and physical characteristics of coal mine dust needed for development of control technology.

Applied research to enhance the fundamental understanding of coal mine dust generation, entrainment, transport and capture mechanisms.

Applied Engineering Control Research

Development of more effective mine dust (including quartz) control systems for modern high production longwalls. These might include new cutting mechanism and tools to reduce dust generation, use of operation practices (face/out-by haulage, headgate cut-out, sprays) to reduce entrainment or use of air distribution systems which create two splits of air (face split, walkway split) along the longwall face to contain dust in the face area.

Development of improved dust control systems for continuous mining units which might include ventilation/spray systems for containing dust to the face area in continuous miner sections and enhance their capture and improved scrubbers for application in continuous-miner sections (higher collection efficiency).

Assessment of sources of dust exposure and dust levels in new mining systems or new mining technology (e.g., continuous miner, diesels, etc.) and development of appropriate control technology.

Development of new technology for airborne dust control utilizing surfactants, change sprays, foams, etc.

Dust Sampling Methods and Surveillance

MSHA in collaboration with NIOSH should analyze available data on sampling and dust exposure conditions to identify a sampling strategy that assures representative characterization of respirable dust exposures under usual conditions of work. The strategy should include the number of samples and frequency of sampling in order to provide accurate and unbiased estimates of exposures.

Development of sampling instruments and sampling methodology for continuous monitoring of personal and area exposures.

Assessment of the relationships between personal, area and environmental sampling, and time-averaged and continuously monitored concentrations.

MSHA and the USBM must test and characterize reliable tamper resistant respirable dust monitoring devices that would provide real time information on the mine dust levels and record the actual concentrations over several days. The devices need to be developed for person-wearable use, as well as environmental monitoring on machines and in areas..

Information and Training

MSHA and the former USBM should evaluate the effectiveness of techniques of technology transfer. MSHA and the former USBM must develop a program to disseminate to the mining industry, and MSHA personnel responsible for respirable dust plan evaluation and approval information on the various methods of respirable dust control. Additionally, MSHA needs to insist on the implementation of such controls where applicable to control respirable dust as part of mine plan approval.

MSHA, in conjunction with NIOSH, should conduct research regarding the impact of training and effectiveness of different training techniques, which could be used to strengthen training program content and delivering/evaluation methods.

CONCLUSION

All Committee members affirmed the recommendation.

ISSUE VIII: REPORTING BY MSHA

FINDING

The Committee finds that considerable interest exists in the subject area addressed by the Committee=s activities. This interest is evidenced by the number of persons attending each of the Committee meetings as well as the number of persons taking advantage of the time provided for public comment. Additionally, the press coverage given to the Committee=s activities as meetings were held around the country illustrates an even larger interest.

Rulemaking is historically a complicated and time consuming process involving considerable effort by the agency involved. The process is made more uncertain by competing agency agenda items and the need to coordinate with other governmental agencies. Therefore, the Committee believes that it is in the best interest of the health of miners that the progress of MSHA in dealing with the Committee recommendations should be publicly reported.

RECOMMENDATION NO. 18

MSHA should make public a report of the progress toward each of the recommendations provided in the report of the Committee. An interim report should be provided by September 1997 with a final report issued by September 1998.

CONCLUSION

All Committee members affirmed the recommendation.

VIII. DISSENTING OPINIONS

The Committee members voted on the record for each separate recommendation described in this report. In 11 of the total of 34 recommendations, at least one Committee member voted not to affirm the position expressed. In every case in which a member could not affirm a resolution to an issue, the Committee ground rules required that such individuals "must state their rationale for their position." To fulfill this requirement, the Chair asked that dissenting viewpoints be submitted in writing for inclusion in the official record of the Committee. These dissenting opinions are presented in this section of the Committee report.

RECOMMENDATIONS 6, 19a, 19b, 19c MINERS' PARTICIPATION IN DUST SAMPLING

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

The Federal Mine Safety and Health Act of 1977 (the "Mine Act") clearly addresses miners' role in the various activities relevant to dust sampling. Where the activity in question is an MSHA inspection, "[s]ubject to regulations issued by the Secretary," a representative of miners "shall be given an opportunity to accompany the [inspector] during the physical inspection of [the] mine . . . , for the purpose of aiding such inspection and to participate in pre- or post-inspection conferences held at the mine Such representative of miners who is also an employee of the operator shall suffer no loss of pay during the period of his participation in the inspection" Mine Act Section 103(f). Where the activity, however, is an operator's monitoring or measuring of employee exposure to potentially toxic or harmful agents, miners and their representatives (again, subject to regulations issued by the Secretary) have an opportunity to observe such monitoring or measuring and to have access to the records, thereof, but not to participate in these activities without loss of pay. Mine Act Section 103(c). In general, therefore, the walkaround-with-pay right extends only to MSHA inspection activity.

Within this broad framework, the walkaround right does not apply to such MSHA non-inspection activities or processes such as investigation, technical assistance, demonstrations, or verification. Furthermore, under the Mine Act, inspections must be unannounced. Thus, the pre-announced MSHA visit to a mine in order to verify a dust control plan (as recommended by the Committee in Recommendation 5) is not an inspection activity and, accordingly, does not trigger the walkaround right. Similarly, to the extent that the activity is operator-conducted measuring or monitoring, the extent of miners' participation rights is confined to no more than observation and access to records.

Miners' participation in the overall dust sampling process should be encouraged, but must be conducted within the framework of the Mine Act. The issue is not so much whether there is a right to participate in a given activity but whether all participation should be without loss in pay. The economic burden to the industry of any widespread paid participation beyond the limits of the Mine Act would be heavy. Furthermore, the Mine Act expressly confers upon MSHA the authority and responsibility to promulgate regulations addressing the scope of walkaround.

MSHA undertook that task in 1978, and should revisit the subject in light of more than 15 years experience under the Mine Act.

Industry welcomes enhanced training and participation of miners in the dust sampling process but cannot agree to proposals outside the limits of the Mine Act that would impose heavy economic burdens on operators.

RECOMMENDATIONS 15, 16d, 16g, 16i
PERSONAL VS. ENVIRONMENTAL SAMPLING

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

The current system of area or environmental sampling to monitor exposure for high risk designated occupations ("DO") and designated work places ("DWP") is intended to, and does provide useful information for environmental control and research purposes. However, by definition and purpose, area sampling is not the best source of information for personal exposure to coal mine dust. Rather, personal sampling, if properly conducted, provides the only accurate representation of personal exposure.

The ultimate measure of any effective dust control program in a mine is the personal, 8-hour exposure of miners working in the mine. The current MSHA mandatory health standard for exposure to respirable coal dust, section 202(b)(2), is based on this premise and is keyed to the personal exposure of miners. Furthermore, such data for any individual, combined with potential CWP progression, is the only scientific basis for developing a PEL for respirable coal mine dust.

In contrast, environmental (or area) sampling of a dusty area, e.g., DO and DWP samples, provides a measure of the efficacy of dust control techniques being used in that environment or at a given MMU.

Several attempts in various countries have been made to infer indirectly personal exposures from directly measured area dust concentrations. To date, however, no mathematical or statistical correlation has been established between the two measurements. Two main reasons for this problem are: (1) the random walk of the individual miner in any 8-hour period, and (2) the existence of very high dust concentration gradients in work places. The latter subject has been thoroughly examined by the U.S. Bureau of Mines, as well as others, and studies reveal that dust concentrations in the vicinity of an MMU may vary by almost an order of magnitude (i.e., 10 times). Dust samplers placed side-by-side on mining machines yield widely varying dust concentrations if their inlets point in different directions. Therefore, the only useful purpose served by any area sample is the immediate control of dust at the source. Area samples must be

taken over a shorter interval, say 30 minutes, so that dust control measures can be optimized in real time. Personal sampling, on the other hand, must be done for an 8-hour period.⁸⁷

By blandly recommending in Recommendation No. 15 that MSHA dust sampling for compliance be based on an "appropriate balance" of personal, occupational and environmental sampling, the Committee is not helpful to miners or MSHA. As emphasized above, the Mine Act's focus is on the exposure of each miner. Thus, Section 202(a) of the Mine Act makes clear that Congress expected samples to be taken of the "amount of respirable dust in the mine atmosphere to which each miner ... is exposed." Similarly, section 202(b)(2) of the Act requires each operator to "continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner ... is exposed at or below 2.0mg/m³.

Environmental sampling is appropriate to adequately measure compliance with the requirement of 30 CFR Part 70.100(b) that the average concentration of respirable dust in the intake airway be at or below 1.0mg/m³ because this particular requirement is not aimed at the exposure of miners. Otherwise, however, environmental sampling is not appropriate to measure the amount of respirable dust to which each miner is exposed because, as noted, there is no way to correlate the results of environmental sampling with each miner's exposure.

The Committee's labor representatives have interjected in the record of these proceedings numerous allegations that personal sampling won't work because industry will manipulate the system to disguise true exposures. These broadside charges are unsubstantiated. More importantly, however, industry's main concern is that the entire mining community must move forward to a more credible system of dust control. Since personal sampling is the optimal means of assessing personal exposure, it is the process that Committee should have recommended.

⁸⁷ We note that devices used for both personal and area sampling need considerable improvement. Difficulties experienced with the existing personal samplers have led to development of some very expensive area samplers (e.g., the tapered element oscillating micro-balance). These instruments help in the engineering control of dust at the source but will not be able to provide even an indirect measure of personal exposure. Therefore, while development and field testing of a continuous dust monitor should receive some attention, the highest priority should be given to "correcting the deficiency" in the present personal dust sampling equipment, as evidenced by the problems uncovered in the AWC litigation.

Industry underscores its willingness to work with MSHA and miners and their representatives to design a program of personal sampling acceptable to all. The Committee's Recommendations No. 15 and 16(d) will encourage the perpetuation of the present system -- a result that would be contrary not only to virtually all of the Committee's deliberations, but also to the public testimony of miners, former miners and industry representatives who have appeared before the Committee.

The industry favors MSHA conducting all compliance sampling. Until that happens, however, the committee Recommendation No. 16g contemplates some operator compliance sampling in the interim. A likely result of setting the tolerance band at so high a level, 90%, will be an increase level of voided samples. To the extent that compliance sampling involves operator sampling, this would impose correspondingly increased administrative costs on operators. To the extent this involves MSHA sampling, it multiplies MSHA's costs. A less restrictive tolerance band would be more practical.

RECOMMENDATION 16i
NORMAL/AVERAGE PRODUCTION

DISSENTING OPINION SUBMITTED BY DR. RAJA V. RAMANI, NEUTRAL MEMBER

Firstly, the reasons cited for voting against the continuance of the operator sampling are applicable here as operators are required to maintain data for compliance purposes. Secondly, when coal is broken, there is a size distribution of the breakage products. When more coal is broken, more respirable dust is produced. However, it does not necessarily follow that the amount of airborne respirable dust or the respirable dust concentration increases. The suppression of the entrainment propensity of the generated dust and the amount of airflow are the two most important factors affecting the amount of respirable dust airborne and the airborne dust concentration. The Committee hearings and discussions on production has been extensive, but conclusions reached and this recommendation are unfortunately inappropriate. For example, in the recommendation, "production should be close to the normal production shift" in the first sentence and "90 percent of the average production in the last 30 production shifts" in the second sentence are inconsistent. This recommendation is also inconsistent with recommendation no. 5. Thirdly, the mine system (including ventilation and dust suppression sub-systems), is planned to achieve a defined production level. Therefore, compliance should be achieved at any production level below the designed level if all other conditions remain the same. MSHA can always declare a sample invalid if the plan parameters are not adhered to. Recommendation no. 5 has addressed this issue.

In voting against this recommendation, this Committee member feels that it is essential for operator to provide MSHA with sampling data showing that the dust control plan is effective for the conditions and production levels for which it is designed. If there is non-compliance (concentrations are above PEL and/or there are non-trivial violations of plan parameters), the committee has already recommended plan modification and verification in recommendation no. 5.

RECOMMENDATION 16d
SINGLE SHIFT SAMPLING FOR COMPLIANCE PURPOSES

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

Throughout these discussions we have attempted to highlight the documented flaws in the use of single samples for compliance purposes due to unacceptably large variations in MSHA's sampling and analytic process. Regrettably, the Committee in choosing to endorse this flawed method for conducting compliance sampling has chosen to ignore not only the vast submissions (see comments of the American Mining Congress, National Coal Association and National Mining Association dated May 20, 1994; November 30, 1994 and June 10, 1996) in response to MSHA's regulatory endeavor but also the very testimony of both MSHA and NIOSH representatives and consultants who are assisting MSHA and serve as the agency's technical experts. The committee's decision to endorse this methodology however, does not resolve the fundamental flaws which renders its application improper.

Both MSHA and NIOSH experts have consistently stated (see *ASARCO v. Secretary*, FMSHRC, Docket No. SE-94-362-RM (1996)) that Sample and Analytic Error (SAE), the error intrinsic to the sampling pump and laboratory analysis process, widely varies for any single sample analyzed by the Agency's laboratories. Yet, these statements and scientific documentation notwithstanding, the majority has endorsed a sampling protocol whose application in the mining environment must be considered experimental at best and of questionable validity at most. What the majority refuses to accept is that the dynamic nature of the mining environment, as opposed to the static nature of manufacturing, create variability which cannot be resolved merely through the application of corrective factors. In any event, the majority has decided to recommend against the application of such corrective factors, see Recommendation 16e.

To better understand the flaws in the majority proposal one needs to take into account that the errors attributable to SAE comprise only a small fraction of the total variability attributable to any single sample. Indeed, numerous MSHA and NIOSH representatives and independent experts (*ASARCO v. Secretary* cited above) have stated that SAE, the error intrinsic to the sampling pump and laboratory analysis, constitutes only about ten percent or less of the total variability inherent in any single sample. Yet, while acknowledging the magnitude and significance of environmental variability, MSHA and NIOSH employees and experts, have affirmed that MSHA simply refuses to include environmental variability in its analysis of a single sample's validity.

More troubling however, is the fact that MSHA's own experts have readily agreed with the proposition that the broad environmental variation attendant to a single sample precludes that sample from being used as an accurate predictor of worker exposure. This fact was reaffirmed by Dr. Paul Hewett who has stated:

In the workplace, there's many different factors that contribute to variability: production level, effectiveness of the ventilation or engineering controls from day-to-day,

individual work practices. The measurements that are derived from the workplace reflect this variability. They also have added to them the variability imparted to the measurement by the sampling and analytic process itself. I said that a single exposure measurement is not an accurate characterization of exposures for an individual worker across some broad span of time because -- primarily because of the environmental factors that affect variability: the difference in production levels, the difference in work practices, the difference in engineering controls -- maybe the process changes. But these factors contribute greatly to observed variability in your measurements.

ASARCO v. Secretary, Deposition of Dr. Paul Hewett at 32 (December 13, 1995)

Similarly, other MSHA experts (*ASARCO v. Secretary*, cited above) have noted they would expect variations in the results obtained from three samples "taken on the same date, same shift, same location," because even though the samples are taken at the same time, the atmosphere is probably not consistent and homogenous."

Simply put, the inherent environmental variability, which the majority recommendation chooses to ignore, associated with changes in time and space, even over a single work shift, is an undisputed fact, and has been well documented in the scientific literature. MSHA's Coal Administration's historical approach to the accounting for environmental variability is to average a multiple number of samples rather than ignore the existence of environmental variability as would be the case under the approved recommendation.

Beyond this however, MSHA officials and experts have expressed the preference for using an average of samples to determine compliance. In other forums MSHA officials and retained governmental and nongovernmental experts give preference to averaging a series of samples rather than relying upon any single sample to reach a compliance determination. For example, MSHA's retained outside expert in the coal single-sample regulatory proceeding Dr. Robert Spear testified that he believed a single-shift measurement above a particular standard can be obtained even though no miner has an exposure above the standard. Specifically Dr. Spear has stated his belief that "one sample in the breathing zone is not a good estimator .. of the mean exposure in the breathing zone;" He went on to state his preference for "proposing two samples on each of ten people to reasonably determine compliance;" and "alternatively proposing at least four or five samples to determine the exposure of any one individual in an indoor environment." (*ASARCO v. Secretary*, Spear Deposition at 157-60; 171-72 and 239-40) The majority position ignores the views of this expert.

RECOMMENDATION 16e
ADJUSTMENT OF PELS TO ACCOUNT FOR
MEASUREMENT UNCERTAINTY

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

The decision of the majority to prohibit the adjustment of the permissible exposure limit (PEL) to account for measurement uncertainty does little more than add insult to injury and exacerbate an already troubling decision. In the preceding recommendation the majority voted to recommend that MSHA utilize the results of single-samples to make compliance determinations. This recommendation which directs that no adjustment be made to the PEL to account for measurement uncertainty ignores the very science which both MSHA and NIOSH have recognized in their single sample rulemaking.

Variation is a measure of the dispersion of data about some central value, typically, the mean. Variation is comprised of sources of error, the error associated with the sampling and analytic process (SAE) and environmental (temporal and spatial) variability. In their proposal of 18 February 1994, MSHA and NIOSH state:

The calculation [for determining compliance] includes variability associated with the sampling and analytical methods. The sampling and analytical variability is expressed as the coefficient of variation, computed by combining random variability associated with the pre- and post-weighing of the filter capsule ($.14 \text{ mg/m}^3$), flowrate variability (5 percent), and variability associated with flowrate adjustment (5 percent). Using an overall coefficient of variation of 10 percent at 2.0 mg/m^3 , MSHA has determined that a single-shift measurement of 2.4 mg/m^3 , for example, would indicate noncompliance with a 2.0 mg/m^3 dust standard with (at least) 97.5 confidence.

59 Fed. Reg. pages 8356-57, February 18, 1994

While the industry believes that the MSHA/NIOSH estimates understate the SAE and environmental variability it is important to recognize that even these organizations recognized that some adjustment must be made to account for this uncertainty. The majority decision disregards this believing instead that a single sample can, with unalterable precision unknown to any researcher, measure the dust concentration to which a miner is exposed. Such an analysis is fundamentally flawed and will dramatically increase the number and frequency of false positives (noncompliance determinations where a workplace was actually in compliance).

It is unthinkable to believe that compliance determinations can be made without regard to SAE and environmental variability. The majority decision will, once again, undermine the credibility of the dust sampling program and result in a de-facto reduction of the PEL by requiring operators to maintain dust levels well below the current standard in order to ensure, with 95 percent confidence, compliance with the 2.0 mg/m^3 standard based upon a single-sample compliance determination. This will result in the need, based upon specific factors, to develop mine-by-mine, if not, section-by-section dust standards. Neither industry nor MSHA can tolerate such a situation.

RECOMMENDATION 16e
ADJUSTMENT OF PELS TO ACCOUNT FOR
MEASUREMENT UNCERTAINTY

DISSENTING OPINION SUBMITTED BY DR. RAJA V. RAMANI, NEUTRAL MEMBER:

Concentration data from MSHA and operator samples, as well as from several research studies of the USBM and this committee member have clearly documented the large spatial and temporal variability of the airborne dust concentration measurements. Respirable dust measurements have GSDs of 2.5, a reflection of the high overall variability. The side by side dust sampling measurements with identical samplers have an average coefficient of variation of 25 percent. The laboratory procedures used to analyze the dust collected on the filters (for concentration and silica content) have also high variability. Therefore, it is only prudent that an enforcement policy takes into account the implications of these sources of variation.

In most inspection and acceptance programs, including health effects= programs, the commonly accepted practice is to define a range about the PEL, whatever the magnitude of the PEL. When measured concentration is at or above the upper limit of the range, the place is deemed to be in non-compliance. When the measured concentration is in the range, it will set in motion an action plan whose objective is to take immediate corrective actions to ensure that non-compliance does not result. The idea of an action level provides a margin of safety for the worker from harmful effects of exceeding the PEL and for the operator against frequent, often late, punitive actions. In effect, the lower limit of the range is an action level. The width of the range is based on the variability of the concentration measurements.

This vote against this recommendation should not be construed as a support for upward adjustment of the PEL; it is to support the development of a rationale enforcement policy. The question with regard to PEL itself has been addressed in recommendation no. 1. In summary, the correct and defensible approach for MSHA is to recognize the variability in airborne dust sampling, and develop a range around the PEL.

RECOMMENDATION 16g SAMPLING TO ABATE CITATIONS

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

Although the Committee, in its Recommendation 16d, urges MSHA to "change the compliance sampling program to allow use of single full shift samples for determining compliance," and, in its Recommendation 16e, urges MSHA to "make no upward adjustment to the PELs to account for measurement uncertainty," nevertheless Recommendation 16g states that citation abatement must be based on operator samples taken "on multiple shifts, as currently required" by 30 C.F.R. Parts 70 and 71.

While we disagree that single full shift samples should be used for determining compliance and that an adjustment factor should not be utilized, if MSHA changes its existing regulations to so utilize single shift samples, then a single full shift sample should also be permitted to demonstrate abatement.

To the extent that the Committee's recommendation insisting on multiple shift sampling for abatement is premised on the notion that such multiple shift samples may be necessary for reverification of the dust control portions of the ventilation plan, we believe that reverification is best handled in a manner consistent with the operator and MSHA verification format set out in Committee Recommendation 5. Specifically, verification sampling (whether by the operator or MSHA) should not be used for enforcement purposes in any fashion, including utilization to show whether or not a citation for violation of the respirable coal mine dust standard has been abated.

RECOMMENDATION 16g
CONTINUATION OF OPERATOR SAMPLING

DISSENTING OPINION SUBMITTED BY DR. RAJA V. RAMANI, NEUTRAL MEMBER:

The credibility of the operator sampling program has been questioned by almost all the representatives of miners who testified in front of the Committee. The court cases of the Department of Labor against several coal mine operators for acts of commission or omission are well documented. Court judgements have only confused the issue; and the operators' views on all these are pretty negative. Apparently, self-policing is not viewed as a success or as desirable by many parties. The lack of credibility of the Operator Sampling Program for compliance purposes has been acknowledged by the Committee in its findings. The Committee's recommendation Nos. 16b, 16 c and 16d, taken together, have addressed the compliance sampling needs. Therefore, the vote against this recommendation is due to the inconsistency with the Committee's findings and this Committee member's belief that a positive atmosphere for self policing is not readily apparent.

There is some question on the ability of MSHA to collect the same number of samples as is being collected by MSHA and operators now. However, this concern is no basis to recommend continuing a sampling program, in which miners appear to have little confidence, the Agency has several concerns, and operators are skeptical of acceptance of the operator's sampling program by all parties. However, the committee member's support of the recommendations Nos. 16b, c and d is to ensure that the MSHA compliance sampling program can proceed to fill the void that will be created when operator compliance sampling program ceases to exist. Further, it is only prudent that operators continue to carry forward a sampling program, albeit without legal coercion, for their own assurance of the performance of the control tools and techniques, and the quality of the atmospheric environment.

RECOMMENDATION 16j
PEL ADJUSTMENT FOR EXTENDED SHIFTS

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

Throughout the Committee deliberations, we have been reminded repeatedly that the Mine Act prohibits miner exposure to greater than 2.0mg/m³ of respirable dust and that this is an environmental standard. The Mine Act is not a labor statute and places no limit whatsoever on the duration of a work shift or the amount of overtime that may be worked. With the current state of knowledge, reducing exposure limits for longer shifts makes no more sense than increasing the exposure limits for shorter shifts (e.g., several 6-hour shifts).

The current 2.0 mg/m³ PEL, as well as the 1.0 mg/m³ PEL recommended in the Criteria Document, were derived from long term, high-dose exposures in the range of up to hundreds of gram-hr./m³. In order for NIOSH to "estimate" the risk of a miner developing CWP after a 45-year working lifetime, it started with the assumption that:

$$1\text{mg/m}^3 \times 40 \text{ years} = 2\text{mg/m}^3 \times 20 \text{ years} = 4\text{mg/m}^3 \times 10 \text{ years} .$$

At the first Committee meeting in Arlington, Greg Wagner proposed that extended shifts may present a greater risk of pneumoconiosis. When queried regarding his basis for such an assertion, he acknowledged only that NIOSH "feels" that exposures up to 10 hours are permissible and that longer shifts could increase the risk of lung disease. (Tr. cite.) He could not provide a scientific basis for this "feeling", nor has any such supporting information been presented subsequently.

Throughout the Committee deliberations and the Criteria Document, the only exposure metric that has been supported by any data is "cumulative exposure." There is no indication that coal mine dust is an acute toxin, nor is it absorbed systematically (as with hydrocarbons) nor has any information been presented regarding the clearance rate. Under the current state of knowledge, it is not known whether working 8, 10 or 12-hour shifts at exposures under the current PEL significantly alters the risk of developing lung disease or, if it does, which shift schedule is more protective (assuming that the same number of hours are worked on a yearly basis). A miner working 8-hour shifts has more time to recover between shifts but a miner working 12-hour shifts has more days to recover between work weeks.

In Dr. Gibbs' correspondence to Dr. Wegman of June 6, 1996 (part of the official Committee record), he included three independent models that are based on lung clearance and deposition mechanisms. This type of modeling approach has the decided potential to elucidate subtle differences between various shift schedules. Industry is hopeful that, in the future, NIOSH will utilize this type of scientific modeling approach.

There are many relevant factors to consider in effectively mandating a change in work schedules, including worker satisfaction, circadian rhythms, job safety, and economics. Any change made for medical reasons should be made on some scientific basis other than a mere "feeling" and with careful consideration as to whether more harm than good will result.

RECOMMENDATION 19f
MSHA COMPLIANCE SAMPLING OF MINES
NOT REPRESENTED BY A RECOGNIZED LABOR ORGANIZATION

DISSENTING OPINION SUBMITTED BY INDUSTRY REPRESENTATIVES:

No documentation was presented to the Committee in support of the recommendation that MSHA should target for compliance sampling those coal mines not represented by a "recognized labor organization." To the contrary, at the Committee's meetings in Pittsburgh, Pennsylvania, Charleston, West Virginia, Salt Lake City, Utah, and Lexington, Kentucky, virtually all of the statements presented by miners regarding their concerns about dust sampling irregularities were made by miners represented by the United Mine Workers of America in connection with mines at which they either had worked or were currently working. We are not aware of any data which demonstrate that the sole criterion of a mine not being represented by a "recognized labor organization" has anything to do with a mine's dust sampling compliance record. Indeed, many such mines have outstanding dust sampling compliance records and excellent programs in place for the protection of their employees from the hazards of respirable coal mine dust.

We do, however, agree that MSHA targeting of mines for compliance sampling, properly done, is a wise and efficient use of resources. In that respect, we agree with that portion of Committee Recommendation 19f stating that "MSHA targeting should be active in nature and should consider many factors including miner input, compliance history, and medical surveillance data." (Emphasis added.) Furthermore, we agree with our colleagues on the Committee that "[g]iven the seriousness of this problem, MSHA should immediately start auditing and appropriately targeting" mines with poor records of dust sampling compliance.

APPENDICES

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List of Documents Distributed to Dust Advisory Committee Members

- X Charter.
- X Notice of Appointment and First Meeting.
- X Agenda of First Meeting.
- X Ground Rules.
- X 30 CFR Part 70, Mandatory Health Standards-Underground Coal Mines.
- X 30 CFR Part 71, Mandatory Health Standards-Surface Coal Mines and Surface Work Areas of Underground Coal Mines.
- X 30 CFR Part 90, Mandatory Health Standards-Coal Miners Who Have Evidence of the Development of Pneumoconiosis.
- X Final Rule, 30 CFR Part 56, et. al., Air Quality: Health Standards for Abrasive Blasting and Drill Dust Control, February 18, 1994.
- X "Healthy Worker Effect in Longitudinal Study of One-Second Forced Expiratory Volume (FEV₁) and Chronic Exposure to Granite Dust," International Journal of Epidemiology, International Journal of Epidemiology, Vol. 24, No. 5, by E. Eisen, D. Wegman, T. Louis, T. Smith, and J. Peters.
- X "A Cross Sectional Study of the Independent Effect of Occupation on Lung Function in British Coal Miners," by S. Lewis, J. Bennett, K. Richards, and J. Britton, Division of Respiratory Medicine, University of Nottingham, September 1995.
- X "Limit Value Assessment for Respirable Coal Mine Dust in Germany," submitted to the Journal of Applied Occupational and Environmental Hygiene.

- X "Assessment of Potential Biases in the Application of MSHA Respirable Coal Mine Dust Data to an Epidemiologic Study," AIHAJ, by Sexias, Robins, Rice, Moulton, October 1990.
- X "Estimating Possible Fraud in Coal Mine Operators' Samples of Respirable Dust," AIHAJ, by James Weeks, 1995.
- X "Analysis of Quartz Exposure Data Obtained from Underground and Surface Coal Mining Operations," Applied Occupational Environmental Hygiene, by Tomb, Gero, Kogut, December 1995.
- X Appendix L-Validation of Predictions of Small Rounded Opacity Prevalence From Attfield and Morring--Criteria for a Recommended Standard, "Occupational Exposure to Respirable Coal Mine Dust," Department of Health and Human Services, National Institute for Occupational Safety and Health, September 1995.
- X "Causation, Impairment, Disability: An Analysis of Coal Workers' Pneumoconiosis Evaluations," JOEM, Volume 38, Number 1, by Prince and Frank, January 1996.
- X "Components of Coal Mine Dust Exposure and the Occurrence of Pre-Stages of Pneumoconiosis," submitted to the Journal of Applied Occupational and Environmental Hygiene.
- X "Particle Collection Efficiency of Two Personal Respirable Dust Samplers," AIHAJ, by Tsai and Shih, September 1995.
- X "The Accuracy of Self-Reported Regulatory Data: The Case of Coal Mine Dust, AJIM 6:427-440 (1984), by Boden and Gold.
- X Federal Register Notice, Coal Mine Respirable Dust Standard and Noncompliance Determinations, MSHA, February 18, 1994.
- X Federal Register Notice, MSHA/NIOSH, Mine Shift Atmospheric Conditions: Respirable Dust Sample, February 18, 1994.
- X Federal Register Notice of Public Hearing, MSHA Coal Mine Respirable Dust Standard and Noncompliance Determinations, June 6, 1994.
- X Federal Register Notice of Public Hearing, MSHA/NIOSH, Mine Shift Atmospheric Conditions: Respirable Dust Sample, June 6, 1994.

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- X Final Rule, 30 CFR Parts 70 and 75, Safety Standards for Underground Coal Mine Ventilation, May 15, 1992.
- X Proposed Rule, 30 CFR Part 75, Safety Standards for Underground Coal Mine Ventilation, May 19, 1994.
- X Final Rule, 30 CFR Part 75, Safety Standards for Underground Coal Mine Ventilation, March 11, 1996.
- X Table of Contents, Second International Mine Ventilation Congress, Reno, Nevada, November 4-8, 1979, Society of Mining Engineers, Sponsored by Mackay School of Mines, University of Nevada, Reno, and MSHA.
- X Table of Contents, International Conference on the Health of Miners, ACGIH, Cincinnati, Ohio, 1986.
- X Table of Contents, Respirable Dust in the Mineral Industries: Health Effects, Characterization and Control, edited by Robert L. Frantz and Raja V. Ramani, The Pennsylvania State University, 1988.
- X Table of Contents, Proceedings of the VIIth International Pneumoconioses Conference, NIOSH-ILO, Part 1, Pittsburgh, PA 1988.
- X Table of Contents, Proceedings of the VIIth International Pneumoconioses Conference, NIOSH-ILO, Part 2, Pittsburgh, PA 1988.
- X Table of Contents, Respirable Dust in the Mineral Industries, Proceedings of the 3rd Symposium on Respirable Dust in the Mineral Industries, October 17-19, 1990, Pittsburgh, PA.
- X Table of Contents, 3rd Symposium on Respirable Dust in the Mineral Industries, edited by Robert L. Frantz and Raja V. Ramani, Littleton, CO, 1991.
- X Table of Contents, 4th Symposium on Respirable Dust in the Mineral Industries, Final Technical Program and Referred Abstracts, November 8-10, 1994, Pittsburgh Vista Hotel, Pittsburgh, PA.
- X Table of Contents, Proceedings of the 1st U.S. Mine Ventilation Symposium, March 29-31, 1982, The University of Alabama.
- X Table of Contents, Proceedings of the 2nd U.S. Mine Ventilation Symposium, University of Nevada, Reno, NV, September 23-25, 1985.

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- X Table of Contents, Proceedings of the 3rd U.S. Mine Ventilation Symposium, October 12-14, 1987, The Pennsylvania State University.
- X Table of Contents, Proceedings of the 4th U.S. Mine Ventilation Symposium, June 5-7, 1989, University of California, Berkeley, CA.
- X Table of Contents, Proceedings of the 5th U.S. Mine Ventilation Symposium, June 3-5, 1991, West Virginia University, Morgantown, WV.
- X Table of Contents, Proceedings of the 6th U.S. Mine Ventilation Symposium, June 21-23, 1993, Salt Lake City, UT.
- X Table of Contents, Proceedings of the 7th U.S. Mine Ventilation Symposium, June 5-7, 1995, Lexington, KY.
- X Table of Contents, The Second International Conference on the Health of Miners, Hyatt Regency Pittsburgh, November 11-13, 1995.
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-General.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Quartz.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Sampling.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Continuous Miners.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Scrubbers/Dust Collectors.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Ventilation.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust-Longwall.@
- X U.S. Bureau of Mines Booklet, ARespirable Coal Dust Control Technology News.@
- X U.S. Bureau of Mines Booklet, ASurface Mine Drill Dust Control Research.@
- X List of References contained in the Criteria for a Recommended Standard, "Occupational Exposure to Respirable Coal Mine Dust," Department of Health and Human Services, National Institute for Occupational Safety and Health, pages 147-218, September 1995.

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- X Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group, September 1993.
- X Report of the Statistical Task Team of the Coal Mine Respirable Dust Task Group, Appendices, September 1993.
- X Report of the Respirable Dust Task Group, June 1992.
- X Program Policy Manual, Subpart B, Dust Standards, Part 70, Volume V, July 1, 1988.
- X Letter, Mr. Mike South, President, National Black Lung Association, to Edward J. Miller, (DFO), February 19, 1996, re: Issues for DAC consideration.
- X NIOSH Criteria Document, "Occupational Exposure to Respirable Coal Mine Dust," September 1995.
- X Work-Related Lung Disease Surveillance Report 1994, CDC, NIOSH.
- X Three Handouts from Presentation by Ronald J. Schell, MSHA, February 21, 1996, First Meeting of the DAC:(1) Common Terms; (2) MSHA Program to Control Exposure to Respirable Coal Mine Dust; (3) ' 75.371(f).
- X Transcripts of First Meeting.
- X Title 30 Code of Federal Regulations, 1995.
- X Federal Register Notice; Reopening of Record, MSHA/NIOSH Joint Finding that a Single-Shift Measurement of Respirable Coal Mine Dust Can Be Used to Accurately Measure the Concentration of Respirable Dust in the Active Workings of a Mine, March 12, 1996.
- X Report of the MSHA Respirable Dust Task Group Team on Dust Control Plan Criteria and Improved Approval Methodology, Executive Summary, 38 pages.
- X Report of the Recommendations of the Special Team on Sampling Strategies and Innovative Concepts, Executive Summary, 37 pages.
- X MSHA Respirable Dust Task Group Education and Training Team, Executive Summary, 25 pages.

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- X Report of the Recommendations of the Respirable Dust Task Group Instrumentation Team, Executive Summary, 33 pages.
- X Report on the MSHA Respirable Dust Team on Spot Inspection and Monitoring Program, Executive Summary, 47 pages.
- X Review of the Program to Control Respirable Coal Mine Dust in the US. Coal Mine Respirable Dust Task Group. Recommendations and Current Status.
- X Expert Reports of MSHA Task Group
 - a. Report on the Respirable Dust Team on Spot Inspection and Monitoring Program, by Bentley, Bollinger, Conrad, Hughes, Vaught, Metzler, Reynolds, Pittsburgh Safety and Health Technology Center.
 - b. Report on the MSHA Respirable Dust Task Group on Dust Control Plan Criteria and Improved Approval Methodology, by Haney, Niewiadomski, Martin, Worrell, Hearl, Jankowski. Pittsburgh Safety and Health Technology Center.
 - c. Report of the Recommendations of the Special Team on Sampling Strategies and Innovative Concepts.
 - d. MSHA Respirable Dust Task Group, Education and Training Team.
 - e. Report of Recommendations of the Respirable Dust Task Group Instrumentation Team.
- X Consolidation Coal Company, Dilworth Mine. Respirable Dust Sampling Inspection Results, August 1, 1995.
- X Anonymous letter, March 14, 1996, to J. Davitt McAteer, Assistant Secretary for Mine Safety and Health, from a Southern Illinois miner, re: dust violations.
- X Application of ILO Classification to a Population without Industrial Exposure: Finds to Be Differentiated from Pneumoconiosis, by Epstein, Miller, Bresnitz, Levine and Geftter; AJR 142:53-58, January 1984.
- X Final rule, Respirable Dust, and Ventilation System and Methane and Dust Control Plan, Parts 11, 70, 71, 75 and 90. Respirable Dust, April 8, 1980.
- X Final rule, Ventilation System and Methane and Dust Control Plan, 30 CFR Part 75, April 8, 1980.

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- X Proposed rule, Public hearings, Miner Participation in Respirable Dust Sampling Procedures, 30 CFR Part 70, April 8, 1980.
- X Proposed rule, Public hearings, 30 CFR Part 71, Respirable Dust, April 8, 1980.
- X Proposed rule, Public hearings, 30 CFR Part 90, Coal Miners Who have Evidence of the Development of Pneumoconiosis, April 8, 1980.
- X Notice of Second Meeting.
- X Agenda of Second Meeting.
- X Minutes of First Meeting.
- X "Prevalence of Pneumoconiosis and Its Relationship to Dust Exposure in a Cohort of U.S. Bituminous Coal Miners and Ex-Miners," by Michael D. Attfield, Ph.D., and Noah S. Sexias, Ph.D., American Journal of Industrial Medicine 27:137-151 (1995).
- X "Longitudinal and Cross Sectional Analyses of Exposure to Coal Mine Dust and Pulmonary Function in New Miners," by Sexias, Robins, Attfield, and Moulton, British Journal of Industrial Medicine 1993, 50:929-937.
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- X "Pulmonary Function of U.S. Coal Miners Related to Dust Exposure Estimates," by Attfield and Hodus.
- X "Clinically Important Respiratory Effects of Dust Exposure and Smoking in British Coal Miners," by Marine, Derek, Gurr, and Jacobson.
- X "An Investigation into the Relationship Between Coal Workers' Pneumoconiosis and Dust Exposure in U.S. Coal Miners," by Attfield and Moring. Am. Ind. Hyg. Assoc. J. (53)/August 1992.
- X Draft--"Dust Related Risks of Radiological Changes in Coal Miners Over a 40-year Working Life: Report on Work Commissioned by NIOSH," by Hurley and Maclaren, Institute of Occupational Medicine, November, 1986.

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- X Graph, CWXSP: Percentage of Examined Miners with CWP (category 21 +), by Tenure in Mining, 1970-1995, CDC.
- X Graph, Proportion of Decedents with Tuberculosis 1979-1991, CDC.
- X Graph, Age Specific Proportions of Death with TB for Selected Condition and All Other Deaths, 1979-1991.
- X "Tuberculosis Comortality with Silicosis-United States, 1979-1991," by Althouse, Bang, and Castellan, Appl. Occup. Environ. Hyg. 10(12) December 1995.
- X MSHA Monthly Dust Sample Report, District/Subdistrict 20212 Waynesburg, PA, April 7, 1994 [Cumberland Mining Co.]
- X MSHA Announcement Made on April 12, 1996 at the 2nd Dust Advisory Committee Meeting, Pittsburgh, PA.
- X Abstract, Continuous Respirable Dust Monitor Development.
- X Abstract, Demonstration of a Continuous Dust Control Parameter Monitoring System.
- X Part 90 Program, 1968-1995.
- X Number of Excessive Dust Citations Issued, FY '90-'95.
- X Findings and recommendations developed and discussed at the 2nd Meeting of the Dust Advisory Committee, April 11-12, 1996, related to Training, Verifying Dust Control Plan Effectiveness, Continuous Dust and Continuous Parameter Monitors, Hazard Surveillance, Ventilation Plan, Monitoring Plan Compliance, Hierarchy of Controls for Underground and Surface Coal Mines, Roles of Government, Miners and Mine Operators and Dust Control Plan.
- X APrevalence of Radiographic Small Lung Opacities and Pleural Abnormalities in a Representative Adult Population Sample," by Zitting, Anders J., M.D., Chest/107/1/January 1995.
- X Handout, AContinuous Respirable Dust Monitor,@ provided to Committee Members at Dilworth Mine Visit, April 10, 1996.
- X Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman (Chair) April 15, 1996, re: request for NIOSH to evaluate data available to define the baseline prevalence

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of abnormal chest x-ray findings consistent with pneumoconioses as a function of age and to compare that baseline with CWSXP data.

- X Transcripts of Second Meeting.
- X Memorandum with attachments, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), April 2, 1996. Attachments:
 - a. Reproduction of Dr. R. Althouse's Poster Session.
 - b. "Pneumoconioses and their Masqueraders," by H.S. VanOrdstrand, M.D., JOM, Vol. 19, No. 11, November 1977.
 - c. "Roentgenological Patterns in Lung Changes that Simulate those Found in Coal Workers' Pneumoconiosis," Eugene P. Pendergrass, Department of Radiology, University of Pennsylvania, Philadelphia, PA 19104.
 - d. "Radiological abnormalities in electric-arc welders," by M.D. Attfield and D.S. Ross, British Journal of Industrial Medicine, 1978, 35-117-122.
 - e. Draft. Coal Mine Dust, September 27, 1995, TLV-TWA.
 - f. "Dust-Related Risks of Radiological Changes in Coal Miners Over a 40-year Working Life: Report on Work Commissioned by NIOSH," by Hurley and Maclaren. Report No. TM/87/09, December 1987.
 - g. "National Coal Study and Related Research Final Report from Round Three of the Study," NIOSH, 1984, PB85-221026.
 - h. Personal communication from Dr. P. Morfeld to Dr. John P. Gibbs, re: scientific validity of the NIOSH criteria document. Received March 4, 1996.
 - i. Letter, Edward J. Miller, (DFO) to Dr. John P. Gibbs, March 25, 1996, re: analyses of coal dust.
 - j. Letter, from Dr. John P. Gibbs, to Dr. David Wegman (Chair) re: analyses of pneumoconioses occurring in miners who started their career after the new standard came out.
- X Minutes of Second Meeting.
- X Notice of Third Meeting.
- X Agenda of Third Meeting.
- X Oral testimony of Glenn Loggins at Third Meeting.
- X Transcripts of Third Meeting.

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- X U.S. Department of Labor, MSHA, Phase I, Environmental Dust Survey, PHTC-DD-90-2C, Blue Creek No. 4 Mine, Jim Walter Resources Inc., Brookwood, Alabama, September 18,-20, 1989, by Robert S. Ondrey, Mining Engineer.
- X U.S. Department of Labor, MSHA, Phase II, Environmental Dust Survey, PHTC-DD-90-407C, Blue Creek No. 4 Mine, Jim Walter Resources Inc., Brookwood, Alabama, December 6-12, 1989, by Robert S. Ondrey, Mining Engineer.
- X U.S. Department of Labor, MSHA, Phase III, Mine Ventilation Pressure-Air Quantity and Face Ventilation Investigations, Investigative Report P333-V237, Blue Creek No. 4 Mine, Jim Walter Resources Inc., Brookwood, Alabama, March 12-14, 1990, Charles D. Campbell, Joseph Denk, Gary Smith, and Gary Wirth.
- X U.S. Department of the Interior, "Protection Factors of the Airstream Helmet," RI 8591, Bureau of Mines Report of Investigations/1981, by Cecala, Volkwein, Thimons and Urban.
- X "Application of the RACAL Airstream Helmet in Four Underground Coal Mines," Appl. Ind. Hyg. Vol. 4 No. 5, May 1989; by Paul S. Parobeck, William J. Francart, Robert S. Ondrey, Richard T. Stoltz, David J. Atchison and Everett J. Gerbec.
- X Findings and Recommendations of the Committee as discussed at the Third Meeting: Hierarchy of Controls for Underground and Surface Coal Mines, Continuous Monitoring, Exposure Monitoring--MSHA Sampling, Training Needs and Hazard Surveillance.
- X Findings and Recommendations distributed to Committee members at the Third Meeting: Role of Miners in Dust Sampling, the Role of the Part 90 Program, Medical Surveillance-voluntary participation, Medical Surveillance II-surface & underground miners and Sampling.
- X An Overview of the U.G. Sampling Program for U.S. Coal Miners from Inception to Present.
- X Part 90 Program, 1968-1996, Revised.
- X Exposure Monitoring Strategies in Different Countries.
- X Letter and attachments, Joseph A. Lamonica (Committee Member) to Dr. David Wegman (Chair), May 27, 1996, Re: Concerning management response to respirable coal dust program.

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- X Presentation Introduction and Closing Text AOHC, San Antonio, Texas, May 1996, remarks by Dr. Peterson.
- X "Development of Effective Protection Factors for Racal Airstream Helmets," The University of Utah, August 1994, Energy West Mining Company, Huntington, UT.
- X Occupational Medicine: State of the Art Review, Gotsch, A.R., Weidner, B.L., Volume 9 (1994).
- X A Decade of Respirable Dust Research for the Mineral Industries; General Mineral Technology Center for Respirable Dust, Ramani, R., Frantz, R. & Bajura, R.; Volume 14.
- X Letter, Dr. John Gibbs (Committee Member) to Dr. David Wegman (Chair), June 10, 1996, re: definition of a working lifetime.
- X Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman (Chair), June 11, 1996, Re: methods and data used by NIOSH in the Criteria Document.
- X Memorandum to Committee Members from Edward J. Miller, (DFO), June 13, 1996 with the following attachments:
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 3, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 5, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 6, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 7, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 7, 1996, re: Peter Morfeld.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 10, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 11, 1996.

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- Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 13, 1996.
 - Letter, Edward J. Miller (DFO) to Dr. David Wegman, (Chair), June 13, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 14, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 17, 1996.
 - Letter, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman, (Chair), June 19, 1996.
 - "Development of Effective Protection Factors for RACAL Airstream Helmets," August 1994, A Mining Research Contract Report, The University of Utah, Energy West Mining Company, Huntington, UT.
 - Minutes of Second Meeting.
 - Media Advisories and press clippings of advisory committee meetings.
 - RI 8591, BOM Report of Investigations 1981, "Protection Factors of the Airstream Helmet," U.S. Dept. of Interior.
 - "Application of the RACAL Airstream Helmet in Four Underground Mines," MSHA, Appl. Ind. Hyg. Vol. 4, No. 5, May 1989.
-
- X Letter with attachments, Dr. John P. Gibbs (Committee Member) to Dr. David Wegman (Chair), June 14, 1996, re: Part 90 miners.
 - X Agenda of Fourth Meeting.
 - X Notice of Fourth Meeting.
 - X Copies of recommendations and findings as developed and discussed at Fourth Meeting.
 - X June 19, 1996, memorandum for Edward J. Miller, DFO, from Robert Shapiro, Associate Solicitor for Legislation and Legal Counsel, U.S. Department of Labor, re: Membership on the Advisory Committee on the Elimination of Pneumoconiosis Among Coal Miners.
 - X Transcripts of Fourth Meeting.

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- X Notice of Fifth Meeting.
- X Agenda of Fifth Meeting.
- X Memorandum, Edward J. Miller (DFO) to Committee members, July 10, 1996, re: Materials for Fifth meeting.
- X Memorandum, Edward J. Miller (DFO) to Committee members, July 15, 1996, re: Materials for Fifth meeting.
- X Memorandum with attachments, Edward J. Miller (DFO) to Committee members, July 16, 1996, re: Material for Fifth meeting: updated findings and recommendations, BOM Peer Review comments on the NIOSH criteria document, tabular and graphical representation of data prepared for the Committee by Mr. Peluso's staff at the PSHTC, information requested by Joe Main relative to the number of orders issued for excessive dust from FY 91 Present and 3 letters from Dr. Gibbs (Committee Member) to Dr. Wegman (Chair)--one letter dated July 15, 1996 and two letters dated July 16, 1996.
- X Newspaper articles re: Dust Advisory Committee Meetings.
 - Pittsburgh Post Gazette, May 19, 1996, Workplace, Shop Talk, "Quartz dust Dangers.@
 - Southern Illinoisan, May 22, 1996, In Brief: "Government issues warning on dust."
 - New Release, U.S. Department of Labor, MSHA, May 23, 1996, "Federal Black Lung Committee Meets in Charleston."
 - New Release, U.S. Department of Labor, MSHA, May 28, 1996, "Federal Black Lung Committee Meets in Charleston."
 - The Charleston Gazette, May 30, 1996, "Tales of Black Lung Told," Ken Ward.
 - The Courier-Journal, May 31, 1996, "Change Urged in Sampling Air in Coal Mines."
- X Comments presented to Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine workers, Mine Safety and Health Administration, U.S. Department of Labor, July 23-25, 1996, Lexington, KY by Morton Corn, Ph.D. CSP, Professor and Director, Division of Environmental Health Engineering, School of Hygiene and Public Health, Johns Hopkins University, 615 N. Wolfe Street, Baltimore, MD 21205.

APPENDIX D

- X Data and graphics developed by the Pittsburgh Health and Technology Center at the Request of Committee member Dr. John P. Gibbs, re: ACumulative Distributions for Roof Bolter Occupations, ACumulative Distributions for Highwall Drill Occupations,@ and ACumulative Distributions for other Occupations.@"
- X Testimony of Dana Hagar, Earl Shackelford, Jr., and Herbert H. Melcalfe, Jr. at the Fifth Meeting.
- X Memorandum, Edward J. Miller (DFO) to Committee members, July 29, 1996, transmitting the recommendations as issued.
- X Memorandum, Edward J. Miller (DFO) to Committee members, July 31, 1996 re: updated findings and recommendations.
- X Transcripts of Fifth Meeting.

Summary of Public Comments

First Meeting:

Mr. Bruce Watzman, National Mining Association, expressed his pleasure with the Chairman=s opening remarks and called on the Committee to keep in mind the economic aspects of mining. He expressed the opinion that there exists a background level of pneumoconiosis which he attributed to tobacco smoke and he called on the Committee to consider this during their deliberations.

Mr. Allen Hess, a third generation coal miner with black lung, spoke on behalf of the National Black Lung Association (NBLA). Mr. Hess offered the NBLA=s assistance in compiling testimony from miners or providing any related information needed by the Dust Advisory Committee in its deliberations. He also expressed the NBLA members= gratitude for the work being done by the Dust Advisory Committee, and requested that some meetings be held in areas where members of the National Black Lung Association could attend.

Second Meeting:

Mr. Tim Hroblak, a miner from Pennsylvania with 22 years of total mining experience, described to the committee his experience with operator compliance methods, having kept track of longwall dust sampling methods since 1989. Mr. Hroblak characterized the current dust sampling as compliance by deception. He spelled out several improvements that could be made in dust control plans, maintenance practices, and MSHA activities to benefit the mine atmosphere. He recommended a closer scrutiny of mine operators by MSHA in order to provide a healthy environment for all miners.

Mr. Ron Priest, a surface mine operator from Central Ohio, addressed a training issue. In his experience, the workers often are uninformed about the hazards or the reason for the sampling procedure. He said that training and education should be improved. Mr. Priest also cautioned the committee about reducing the standard, which could result in lost jobs. He stressed the importance of MSHA, UMWA, and the company working together.

Mr. Dennis O=Dell, Chairman of the Safety Committee at the mine where he is employed, was concerned that the committee was unaware of what miners live through every day. He described those he knew who are dependent on oxygen tanks to breathe, and asked the Committee to remember the human lives involved. He also stated that some miners are intimidated easily and may do something because they are going to save their job, not worrying about what they=re doing for their health. He reiterated the importance of working together to save lives.

Mr. Tom Knight of Kerr McGee Corporation challenged the committee to remember that non-compliance with a current dust control plan does not necessarily mean that the PEL has been

exceeded. In Mr. Knight's assessment, the committee should not be in a solution-oriented mode without first determining if a problem exists. He also stated that some definition of critical parameters and some framing of what is substantive as far as a change in a parameter is key, and has not been addressed by the committee.

Mr. Jim Taylor, Chairman of the Safety Committee at his mine and a miner for 21 years, expressed his concern with inadequate sampling procedures at surface mines. He stated that in his experience, there are no guidelines on production, and Mr. Taylor described sampling being done during shifts that were primarily maintenance work. He called on the Committee to address production levels when samples are collected.

Mr. Gene Davis, a UMWA underground safety inspector, spoke about recordkeeping. Although he believes the mine and MSHA have more complete records, the miners are only advised of the production in tonnage on the day of sampling. Additionally, Mr. Davis urged the adoption of an 80 percent production trigger for valid samples in place of the 50 percent now required, because it would be a more realistic representation of actual working conditions. He also asked the committee to recommend full shift sampling for those working more than eight hour days. Finally, he stated that unless cited, mine management will not revamp a plan even if mining conditions have changed, since there is no incentive to do it.

Ms. Beth Johnson, industrial hygienist with American Electric Power, stated that the basis of the recommendations in the NIOSH Criteria Document for Respirable Dust was research conducted in the United Kingdom twenty-five years ago, and that working conditions in the U.S. today are not necessarily comparable. Furthermore, and in regards to the abnormal white center cases, Ms. Johnson noted that although there may be some guilty parties in the industry, not all are tampering, nor do all operations manage their compliance by deception. She advised the committee not to lower the PEL, since the number of cases of CWP has reduced over the years since the 2.0 mg/m³ standard was put into place.

Mr. Steven Garcia, Eastern Associated Coal Company, commented that the coal mine environment is constantly changing. He stated that you can be in 100 percent compliance of your dust control parameters and be in violation.

Third Meeting:

Mr. Gerald Ellison, a preparation plant worker from West Virginia. He told the Committee that although a dust collection system was installed during the construction of the plant where he works he doesn't believe that the system has ever operated. He urged the committee to recommend that MSHA take a more active role in monitoring the dust at mines and surface areas of mines.

Mr. Reginald Sizemore, a West Virginia miner with 25 years experience, commented on extended shifts. He stated that sampling should be portal to portal, to assess the exposure the entire time of production.

Mr. Robert Knisely, an underground miner from West Virginia, stated that, in his opinion, because of deficiencies in the current regulatory system and operator dishonesty, changes need to be made in monitoring and controlling dust levels in the work place. He also emphasized that dust problems occur at other locations in outby areas away from the face.

Mr. Brett Dillon, an underground miner for 20 years and the president elect for his local union, described his observations regarding MSHA and operator sampling practices, non-face areas with dust problems, the frequency of cutting through rock, and the problems with sampling only for 8 hours on a 12 hour shift.

Mr. Ronald Murdock an underground miner with 20 years of experience, 6 at the face and 14 on the coal conveyor belt lines, described a persistent dust problem on belt lines in the mine where he works. He identified belt transfer points and areas of high velocity as locations where dust repeatedly leads to citations. He also spoke of his inability to wear a respirator due to the high level of activity required by his job.

Mr. Randy Clements, an Alabama miner and safety committee member with 15 2 years of experience, spoke about problems that have been reported to the safety committee during dust sampling days. He concluded that in his opinion, operators should be required to continuously sample to evaluate their plans, and Airstream⁷ helmets should not be equated with engineering controls.

Mr. Glenn Luggins, a miner for 18 years in mining in Alabama, stated that manipulation of mining conditions takes place on longwalls during sampling periods, and expressed the opinion that MSHA should take over all sampling.

Mr. Danny Sparks described the present dust sampling system as being too easy to cheat and explained that a number of work positions underground besides those at the face are exposed to high concentrations of dust and should be sampled. He suggested that production levels on sampling days should be the same as it is on nonsampling days.

Mr. Edmond Rose, a preparation plant worker from Virginia with 20 years of experience, told the committee about dust exposures in surface occupations.

Mr. Clarence Estep, an underground miner from Virginia, reiterated that conditions on sampling days are often different than regular production days. He stated that sampling is not done on days when longwalls are mining through a sandstone roll and that attention needs to be given to dust in outby areas.

Mr. Roy Phillips, a worker from Virginia, asked the committee to remember the lives involved and to make recommendations that could be acted upon quickly. He advocated the use of instantaneous dust monitoring equipment so that conditions could be corrected immediately.

Mr. Luther Chaffin, a miner for 25 years, described his personal experience with sampling pumps and thanked the committee for their efforts to improve dust conditions.

Mr. Bob Wheeler, retired NIOSH public health official, stated that most of his career with NIOSH was spent going into mines studying diesels, coal mine dust, longwalls, and drill operations and he discussed the result of some of the studies, including successful efforts to enroll more miners in the free x-ray program..

Mr. Bruce Watzman, National Mining Association, questioned the analytical accuracy of the MSHA laboratories charged with weighing and analyzing coal and quartz dust samples. He also stated that if all currently available engineering controls are in place, miners should not be denied the protection afforded by personal protective equipment, and operators should be credited for their use.

Mr. Tom McNider, Jim Walters Resources, commented on sampling to determine miner=s exposure to respirable dust, and stated that only personal samples truly represent a miner=s exposure. He also expressed the opinion that administrative controls and personal protection should be utilized and operators should be given credit for their use.

Mr. Gerry Torbert, Advanced Technology Systems, spoke on the role of statistics in dictating an appropriate sampling scheme, and the potential use of contractors for some of the tasks proposed by the committee.

Mr. Richard Casto, a coal miner from Southern West Virginia for twenty years, related his personal experiences with dust on many different underground job sites. While supporting the use of continuous monitors for dust, he indicated that many small operations could not afford them and would have to continue to rely on regular dust sampling. He urged the committee to make improvements for the benefit of future miners.

Mr. James Linville, a surface miner for 14 years in West Virginia with a total of about 25 years of experience in various aspects of mining, described a recent MSHA inspection that he stated was conducted following two days of rain when dust would be under control. He described the working conditions of the miners being sampled during this inspection and expressed the opinion that conditions on that day were not normal. He encouraged increased sampling for surface occupations, and improved cooperation between MSHA, industry, and the union.

Mr. Richard Ryan, a preparation plant worker from West Virginia, spoke of the poor dust conditions in the plant where he works, and asked for better protection for surface miners. He stated that surface miners should be included in the x-ray surveillance program and that at present, if a surface miner wants an x-ray taken, he must pay for it himself.

Mr. Thomas Wilson, a UMWA International Health and Safety Representative from Alabama described a 1989 environmental dust survey conducted at a mine in his area. He explained that this MSHA survey demonstrated that the manipulation of engineering control parameters is common on sampling days.

Mr. Randy Clements, an Alabama miner and safety committee member, stated that he thinks guidelines should be put into dust control plans to protect surface workers from respirable dust.

Mr. Dennis O=Dell, a West Virginia miner for 22 years, told of his dismay that a miner=s health seems to be currently dependent on whether the company he works for is health and safety conscious, or strictly profit-driven. He told the committee not to recommend the use of respirators or Airstream⁷ helmets because of additional breathing resistance problems, and visibility concerns.

Fourth Meeting:

Mr. Tom Wilson, UMWA International Health and Safety Representative from Alabama, stated that the current system of operator sampling or an improved operator sampling program would be better than a system that would reduce the annual number of samples collected per mine from 31 to four.

Mr. Jim Stevenson, UMWA, indicated that miner=s annual refresher training needs to be improved to include dust issues, and that engineering controls must be the primary control method. He also supported the idea of MSHA inspectors discussing conditions with miners during sampling inspections.

Mr. Victor Fortna, a mining engineer and certified industrial hygienist with Kennecott Corporation, stated that the current regulations were the result of a panic situation caused by the high incidence of CWP and that the same panic situation does not exist today. He stated that tremendous progress has been made over the years in a decreasing prevalence of pneumoconiosis, and that programs in place could be fine tuned to make improvements. He also stated that, in his opinion, there is no need to extend medical surveillance to surface miners because that is not where the problem is.

Mr. Tim Brady, a miner from Utah, questioned why Airstream⁷ helmets are not recognized as part of the dust control plan, and spoke in favor of their use as a shearer operator.

Mr. Gary Jensen, representing Southern Utah Fuel Company, commented that having more stringent regulations will not guarantee compliance, and also spoke on the use of respiratory protection and continuous monitors.

Mr. Rick Snyder, UMWA, stated that prevention is better than treatment, and surface miners should be included in the x-ray surveillance program.

Mr. Forrest Addison, UMWA, described underground mining conditions on sampling days as opposed to typical days, and spoke in support of continuous monitoring as a better way to assure that the atmosphere is always in compliance.

Mr. David Hales, an employee of Southern Utah Fuel Company, told of how miners at his operation had been actively encouraged to participate in the NIOSH x-ray program. He also noted that other testimony had described non-compliance situations, which he said indicates that compliance is the underlying problem, not the existing standard.

Mr. Bert Peacock, UMWA, advised that MSHA should make note of production on sampling days, and compare this with the average daily production to interpret the results properly. He also advised that the sampling device should stay with the occupation being sampled.

Mr. Bill Cransford, a miner from Utah and the safety committee chairman at his mine, reminded the Committee of the effective engineering controls they had witnessed in their mine tour, and reiterated the importance of technology in resolving problems.

Fifth Meeting:

Mr. Bob Billingsley, a surface miner from southern Illinois with 18 years of mining experience, stated that there is a need for a dust control plan for surface mines and that miners must be trained in proper dust sampling practices. He commented that mine operators and MSHA should jointly take responsibility for sampling and sampling should be done during the bimonthly MSHA inspection. He told the Committee that he normally works 5 or 6 10-hour shifts per week and has on occasion worked 7 10-hour shifts in one week.

Mr. Dave Hadley, a surface miner from Indiana with over 20 years of mining experience, told the Committee that in his opinion the current sampling system is broke and is in need of repair. He suggested that the miner be paid to participate in the dust control program.

Mr. Larry Hatton, an underground coal miner from Kentucky with over 20 years of experience in both UMWA and nonunion mines, recommended that the dust pumps be sealed to prevent tampering or improper operation during sampling.

Mr. Dana Hager, a disabled miner from Kentucky with 20 years of experience underground, stated that the current dust sampling program does not work. He testified that, in his experience, samples were collected from intake airways and bathhouses and did not represent the air miners worked in and breathed. He stated that on sampling days, production dropped and ventilation curtains were repositioned to keep the machine operator in fresh air. He recommended that, in his opinion, the only way to ensure compliance with the dust standards is for MSHA to take over the dust sampling program.

Mr. Jimmy Light, a surface miner with 27 years experience, submitted pictures of an automatic drill, an air drill and loader to emphasize the conditions under which miners work while operating these machines and the amount of dust that is generated. He stated that some miners work in these dusty environments for 10 or 12 hours shifts. He told the Committee that in his opinion, not enough emphasis has been placed on dust control in surface mines.

Mr. Tim Birchfield, a mine construction worker and vice president of his union local, stated that construction miners have been neglected long enough and recommended that construction miners be covered by a dust control plan and that dust monitoring be conducted during the various construction phases of mining.

Mr. Fred Wagner, a surface miner from Illinois and president of his UMWA local, stated that surface mines do need a dust control plan and recommended that the miner and the miners' representative be involved in sampling. He also suggested that the more samples need to be collected at surface mines.

Mr. Danny Shepherd, a disabled coal miner with 16 years underground experience, stated that MSHA's dust sampling program needs a complete overhaul. He testified that due to years of working in mines with high dust levels he now has second stage Black lung disease. He told the Committee that during his employment at different mines, some mines rarely sampled, rarely hung ventilation curtains, and during sampling often switched the dust cassettes and turned off the pumps. He recommended that MSHA take full control of the dust sampling program to prevent fraud.

Ms. Anita Brandan, underground coal miner from Kentucky with 10 years of experience, stated that MSHA should take full control of the dust sampling program. She stated that sampling practices were only followed on days when MSHA was present and that conditions on nonsampling days were totally different than on days when samples were collected.

Mr. Buddy Humphries, a miner from Alabama and president of the UMWA local at his mine, stated that dust control plans are needed to protect miners working outside, whether at strip mines, construction sites, or surface facilities of underground mines.

Mr. Les Rone, a surface coal miner from southern Illinois, reiterated that dust control plans be developed for surface mines. He emphasized the need for companies to purchase equipment with dust control in mind and gave an example of a loader that was purchased at his mine without an air-conditioning unit. He stated that this would require the operator of the equipment to open the door of the cab during hot weather which would defeat the purpose of the cab.

Mr. Andy Eads, a surface miner from Alabama, stated that he was a rock truck driver who spends the entire shift in an enclosed cab and at the end of the day he could knock the dust off his clothes. He urged the development of dust plans for surface mines.

Mr. Ray Burns, a surface miner from Alabama, stated that dust samples were not always accurate because he was often asked to wear sample equipment on rainy days, days that it was going to rain, and on the day after it had rained.

Mr. John Lunsford, a miner from Alabama, spoke of his 22 years of experience and expressed concern for persons who do not work in enclosed cabs such as welders, mechanics, electricians, and pumpers. He requested more dust sampling to protect these individuals.

Mr. David Deppi, a surface miner from Illinois, stated that all areas of a surface mine are subject to dust and surface mines need the protection of a dust control plan. He told the Committee of getting into his automobile at the end of his shift and finding both the inside and outside of the car coated with coal dust. He called on the Committee to recommend dust controls for all areas of surface coal mines.

Mr. John Stewart, an underground miner from Alabama, stated that there should be no differentiation between underground and surface coal mines because both generate dust.

Mr. Charles Fikes, an underground miner from Alabama, stated that all mines need to be under the same sampling and monitoring systems. He told the Committee that when continuous dust monitors become available, all mines should be required to use them.

Mr. James Bell, an underground miner from Alabama, stated that MSHA should take over the dust sampling program, that the samples should be based on the occupation, and that miners should participate in the dust sampling. He also suggested that the practice of occupational sampling should be continued and that additional training be provided.

Mr. David McAteer, an underground miner from Alabama, indicated that sampling should be increased and not reduced and that MSHA should scrutinize operator sampling. He stated that miners should be trained in the hazards associated with coal mine dust. He told the Committee of problems on the surface from dry coal dust being blown around the property by the wind.

Mr. Frank Jeters, an underground miner from Illinois, spoke of his experience regarding the activities that are conducted during sampling when MSHA is and is not present. He stated that miners should be allowed to participate in the dust sampling to prevent fraud. Miners should also be trained in the hazards of working in coal mine dust.

Mr. Dave Hadley, welder and member of UMWA, spoke about the deficiencies in the current sampling program and recommended that required sampling for designated occupations and designated work places be enforced, including improvements at surface mines.

Mr. Bob Hicks, an underground repairman from Illinois, stated that conditions on sampling days are often different than regular production days, due to the extra attention he has been told to give to rock dusting and cleaning scrubbers and filters just prior to sampling days.

Mr. Jackie Clayton, underground miner from western Kentucky and UMWA member, reiterated that the miners= representative should take part in the operator=s dust sampling, and that MSHA should increase sampling of all operations, and should sample full shift.

Mr. Dwayne Childers, underground miner and chairman of the safety committee at a mine in western Kentucky, suggested that miners be trained in dust sampling and related hazards. He stated that the current system has lost its credibility because the conditions on sampling days are never the same as typical mining conditions. He characterized outby jobs as often very dusty.

Mr. Robert Royalty, recently retired miner from Indiana, related his personal experiences with dust in different occupations and urged the committee to make improvements for the benefit of future miners by developing tamper resistant dust samplers, and sampling critical areas more frequently.

Mr. Kenneth Stevens, a miner from Indiana, spoke of the very dusty mine conditions he worked in for years and stated that he is now disabled. He stressed the importance of acting now to eliminate poor working conditions in the mines.

Mr. John Stewart, a miner from Illinois with 23 years of underground experience, stated that conditions on sampling days are often different than regular production days. He urged that more occupational samples be taken.

Mr. Mike South, President, National Black Lung Association, reiterated his request that the 2.0 mg/m³ standard be lowered and that MSHA take over the dust sampling program, along with UMWA personnel.

Mr. Michael Dillingham, a third generation coal miner stated that he is 41 years old and was diagnosed with black lung 2 years ago. He suggested that miners should be allowed to participate and be trained in the dust sampling program.

Mr. Bob Billingsley, an Illinois surface miner, discussed technology used at his mine and in several places in Southern Indiana and suggested that this might be a good place to test continuous monitors..

Mr. Earl Shackelford, a miner from southeastern Kentucky, stated that he has worked for 22 different companies in the 17 years he has worked underground. He testified that, in his opinion, all of the mining companies where he worked cheated on their dust samples. He stated that to keep from being fired, he unwillingly participated in the dust fraud. He recommended that MSHA take control of the dust sampling program and to sample more frequently.

Mr. Herbert Metcalfe, a disabled miner from eastern Kentucky, spoke of the dusty working conditions he experienced at different job sites and alleged that illegal sampling practices were

APPENDIX E

carried out when inspectors were not present. He called on the Committee to assist in the overhaul of the dust sampling program.

WORKING GROUP MEMBERSHIP

Medical Surveillance :

Dr. David Wegman
Dr. John Gibbs
Dr. Kathleen Kreiss
Dr. James Weeks

Mine Ventilation Plans:

Dr. John Dement
Mr. Joseph Lamonica
Mr. Joseph Main
Dr. Raja Ramani
Dr. Carol Rice

ISSUES IDENTIFIED BY THE DUST ADVISORY COMMITTEE

- * Should there be a change in the level of allowable exposure to coal mine dust?
 - > Should there be a separate silica standard that includes an allowable exposure to airborne silica particulate as well as the related aspects of sampling, controls, medical monitoring and training?.
- * Should there be changes in the methods and procedures for the evaluation of exposure to coal mine dust?
 - > Should there be a change in the MSHA rules and procedures for monitoring coal mine dust?
 - > Should operator sampling results be used for evaluating compliance with the PEL? (e.g., instrumentation, sample site selection, quality control and assurance).
- * Under what circumstances is continuous monitoring of coal mine dust concentration appropriate?
- * Under what circumstances does area sampling of the coal mine environment provide dust concentration data useful for the protection of coal miner health?
- * How should a dust control plan be designed, implemented and evaluated for effectiveness in order to assure that coal mine dust and airborne silica particulate levels are maintained below the PEL?
- * Should MSHA develop and implement a hazard surveillance program? (e.g., a program to examine and act on trends in results of monitoring both dust levels and controls)
- * Should there be changes in training for miners, inspectors, and others responsible for air sampling, data interpretation and implementation and maintenance dust controls.
- * Should there be changes in the medical surveillance program and the way the data from the program is utilized?
- * Are changes needed to assure that exposure control measures follow the recognized hierarchy (e.g, first choice engineering, next administrative; and last, use of personal protection devices) and that modifications are made in a timely manner when. reliable data on new approaches becomes available.

APPENDIX G

- * In what ways can miner participation in eradicating dust related diseases be improved? In what ways can participation in the medical surveillance program be improved?
- * Should the surveillance of exposure, implementation of dust controls and conduct of health surveillance for surface miners differ from underground miners?
- * Is the Part 90 program accomplishing its goal?
- * What improvements are needed in the collection and maintenance of coal mine dust exposure levels, dust controls, production levels, ... are needed?
- * What research questions must be answered to eradicate disease?

Working Document developed and used by the Advisory Committee during Deliberations:

PROGRAM DESIGN AND IMPLEMENTATION

I. Objective is preventing pneumoconiosis by controlling exposure at or below the exposure limit

A. For respirable coal mine dust

Should there be a change in the level of allowable exposure to coal mine dust?

B. For silica

Should there be a separate silica standard that includes an allowable exposure to airborne silica particulate as well as the related aspects of sampling, controls, medical monitoring and training?.

II. Controls required to achieve exposure limits.

A. Appropriate use of hierarchy of controls:

Are changes needed to assure that exposure control measures follow the recognized hierarchy (e.g, first choice engineering, next administrative; and last, use of personal protection devices)

B. Appropriate implementation of new technology

How can there be assurance that modifications are made in a timely manner when reliable data on new approaches becomes available.

C. Implementation of dust control plan (with appropriate parameters of effectiveness)

How should a dust control plan be designed, implemented and evaluated for effectiveness in order to assure that coal mine dust and airborne silica particulate levels are maintained below the PEL?

D. Difference in principles of implementation for dust controls in surface mines?

Should the implementation of dust controls for surface miners differ from underground miners?

III. Effectiveness of controls determined primarily by monitoring exposure

A. Approach to sampling for exposure levels

Should there be changes in the methods and procedures for the evaluation of exposure to coal mine dust?

1. Conditions for sampling (are samples representative?)

What improvements are needed in the collection and maintenance of coal mine dust exposure levels, dust controls, production levels, ... are needed?

2. Role of continuous monitoring

Under what circumstances is continuous monitoring of coal mine dust concentration appropriate?

3. Personal or environmental sampling.

Under what circumstances does area sampling of the coal mine environment provide dust concentration data useful for the protection of coal miner health?

4. Operator sampling for compliance.

Should operator sampling results be used for evaluating compliance with the PEL? (e.g., instrumentation, sample site selection, quality control and assurance).

- B. Miners= role in dust sampling?

In what ways can miner participation in eradicating dust related diseases be improved?

- C. MSHA rules and procedures for sampling.

Should there be a change in the MSHA rules and procedures for monitoring coal mine dust?

- D. Dust sampling for surface mines.

Should the surveillance of exposure for surface miners differ from underground miners?

- E. MSHA approval of operators=s mine plan

IV. Medical surveillance

- A. The nature of the program offered.

Should there be changes in the medical surveillance program and the way the data from the program is utilized?

- B. The incentives and disincentives for miner participation in medical surveillance.

In what ways can participation in the medical surveillance program be improved?

- C. The role of the Part 90 program.

Is the Part 90 program accomplishing its goal?

- D. Differences in principle for surface miners.

Should the surveillance of exposure and conduct of health surveillance for surface miners differ from underground miners?

V. Training and education

A. Of miners

B. Of mine operators and

C. Of persons to measure dust exposure

Should there be changes in training for miners, inspectors, and others responsible for air sampling, data interpretation and implementation and maintenance dust controls.

PROGRAM EVALUATION

VI. Records making, collection. use

A. Medical records

Should there be changes in the way the data from the medical surveillance program is utilized?

B. Hazard surveillance program by MSHA ?

Should MSHA develop and implement a hazard surveillance program? (e.g., a program to examine and act on trends in results of monitoring both dust levels and controls)

VI. Research needs

A. Medical and epidemiologic

B. Engineering R&D for: dust control methods

What research questions must be answered to eradicate disease?

Advisory Committee on the
Elimination of Pneumoconiosis
Among Coal Mine Workers

GROUND RULES

These ground rules will govern the conduct of the Labor Department Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers. [Dust Advisory Committee (DAC)]. The DAC is established under Sections 101(a) and 102(c) of the Federal Mine Safety and Health Act of 1977 and the Federal Advisory Committee Act.

A. COMMITTEE MEMBERSHIP

1. The DAC shall consist of 9 voting members appointed by the U.S. Secretary of Labor, one of whom will be designated by the Mine Safety and Health Administration of the U.S. Department of Labor (MSHA) to serve as the Chair of the committee. MSHA shall designate a Federal Official (DFO) to serve as the spokesperson of the Department of Labor and to be a full and active participant in the consensus building discussions but who will not vote on any matter.

2. Each member shall be appointed by the Secretary and shall serve until the dissolution of the Committee unless he or she becomes unable to serve or resigns.

3. Each member will be provided with a list of the other members prior to the start of the first advisory committee meeting.

4. Observers - Committee meetings will be announced in the Federal Register and will be open to the public unless notice to the contrary is provided in the Federal Register. All observers will identify themselves and their affiliation by entering this information in a designated log.

B. FACILITIES AND SERVICES

1. MSHA will pay the per diem and travel expenses of the members.

2. MSHA will provide for suitable meeting rooms, appropriate secretarial and support staff, as well as equipment and resource material.

3. Expenses for experts, advisors, or additional consultants may be paid at the discretion of the DFO.

C. COMMITTEE MEETINGS

1. Schedule - Except for meeting dates scheduled by the Chair and approved by the DFO prior to the first meeting, all meeting dates of the DAC will be scheduled by a consensus vote of the members and with the approval of the DFO. Changes in the DAC meeting schedule, once established, including extending the time for discussion at a meeting, may be made by a consensus of the committee or at the discretion of the Chair. All changes in schedule or scheduling of additional time must receive prior approval of the DFO.

2. Announcement - The time, date, place and purpose of all meetings shall be published in the Federal Register at least 15 days prior to the date of the meeting. This announcement shall also include a summary of the meeting agenda.

3. Time frame - There will be six separate sessions for DAC meetings. Each session will consist of 2 or 3 day meetings. The sessions will be spread over approximately 180 days.

4. Quorum - A minimum of 5 members are required to be present to hold a meeting of the DAC.

5. Discussion - Only agenda items will normally be open for discussion at each meeting. Any material submitted for consideration by the DAC should be forwarded to the DFO for reproduction and distribution at least 20 days prior to the scheduled meeting. Should the DAC want to discuss issues not on the agenda, a majority vote of all members present is required as well as the approval of the Chair.

6. Caucuses - Members may caucus during a discussion at the discretion of the Chair. The time allowed for a caucus will be set by the Chair. General Services Administration regulations allow for caucuses to be held to gather information, conduct research, analyze relevant issues and facts, or to draft a proposed position paper for deliberation by the advisory committee.

D. VOTING

1. Proxy - A member who, due to illness or personal exigency, cannot attend a meeting may notify the Chair or the DFO and request that another member of the DAC be given his/her proxy. Each proxy counts as one vote.

2. Neutral members - No vote shall be taken at a meeting unless the votes of the Aneutral@ members, that is, votes or proxy votes of members who are not representing the mining industry or labor, constitute at least 50 percent of the votes present. This provision shall not apply at the final meeting of the DAC.

3. Voting by issues - Each issue will have its own resolution which will be voted on separately from other resolutions.

4. Consensus - Consensus occurs when a majority of the votes cast are in favor of or against the resolution on an issue.

5. Majority - A majority is a simple majority of the votes cast except that abstentions are not counted.

6. Voting - Members affirming a resolution to an issue need only state their affirmation. Members not affirming a resolution to an issue must state their rationale for their position. Members may abstain from voting and are neither obligated to state the reason for their abstention nor required to propose an alternate resolution. Deferral of voting by the DAC on any issue may be by a majority vote of the DAC or at the discretion of the Chair.

6. Initialing - Upon reaching consensus on any issue, each member will sign-off on such consensus by initialing the agreed upon resolution.

E. RECORDS

1. Minutes - Each meeting will be recorded and detailed minutes will be made part of the official record. The minutes will be made available to each member prior to the next meeting. Errors and inconsistencies may be noted by members at the next meeting with recommendations for corrections to the minutes which can be made at the discretion of the Chair.

2. The official record shall consist of minutes, appendices, working papers, drafts, studies, agenda, and all other materials which were either prepared for or used by the DAC, or referred to by the DAC as a supporting document in a consensus resolution.

APPENDIX J

	DR WEGMAN	DR KREISS	DR RICE	DR DEMENT	DR RAMANI	DR GIBBS	MR LAMONICA	MR MAIN	DR WEEKS	AF/OP/AB
REC 1	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 2	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 3	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 4	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 5	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 6	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	OPPOSE	OPPOSE	AFFIRM	AFFIRM	6/2/1
REC 7	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 8	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 9	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 10	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 11	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 12	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 13	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 14	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 15	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	OPPOSE	OPPOSE	AFFIRM	AFFIRM	7/2/0
REC 16 a	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 16 b	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	AFFIRM	AFFIRM	8/0/1
REC 16 c	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 16 d	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	OPPOSE	OPPOSE	AFFIRM	AFFIRM	7/2/0
REC 16 e	AFFIRM	AFFIRM	ABSTAIN	AFFIRM	OPPOSE	OPPOSE	OPPOSE	AFFIRM	AFFIRM	5/3/1
REC 16 f	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	AFFIRM	AFFIRM	AFFIRM	8/0/1
REC 16 g	AFFIRM	AFFIRM	ABSTAIN	AFFIRM	OPPOSE	OPPOSE	OPPOSE	AFFIRM	AFFIRM	5/3/1
REC 16 h	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	AFFIRM	AFFIRM	AFFIRM	AFFIRM	8/0/1
REC 16 i	AFFIRM	AFFIRM	AFFIRM	AFFIRM	OPPOSE	OPPOSE	OPPOSE	AFFIRM	AFFIRM	6/3/0
REC 16 j	ABSTAIN	ABSTAIN	ABSTAIN	ABSTAIN	AFFIRM	OPPOSE	OPPOSE	AFFIRM	AFFIRM	3/2/4
REC 17	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 18	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 19 a	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	OPPOSE	OPPOSE	AFFIRM	AFFIRM	6/2/1
REC 19 b	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	ABSTAIN	OPPOSE	AFFIRM	AFFIRM	7/1/1
REC 19 c	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	OPPOSE	OPPOSE	AFFIRM	AFFIRM	7/2/0
REC 19 d	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 19 e	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
REC 19 f	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	OPPOSE	OPPOSE	AFFIRM	AFFIRM	7/2/0
REC 20	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	AFFIRM	9/0/0
AF/OP/AB	33/0/1	33/0/1	31/0/3	33/0/1	28/3/3	23/9/2	22/11/1	34/0/0	34/0/0	

APPENDIX J

Summary of Votes Cast by Members of the Advisory Committee on the Elimination of Pneumoconiosis among Coal Mine Workers